

(19)



(11)

EP 2 952 308 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
13.09.2017 Bulletin 2017/37

(51) Int Cl.:
B27M 3/00 (2006.01) **B27F 7/00** (2006.01)
B27F 7/02 (2006.01) **B65H 75/50** (2006.01)

(21) Application number: **15170448.3**

(22) Date of filing: **03.06.2015**

(54) **NAILING MACHINE, PARTICULARLY FOR ASSEMBLING FLANGES OF WOODEN SPOOLS FOR WINDING ELECTRICAL CABLES, STEEL CABLES, ROPES, FIBER OPTIC CABLES OR WIRE-LIKE ELEMENTS IN GENERAL**

NAGELMASCHINE, INSBESONDERE ZUR MONTAGE VON BÜNDEN VON HOLZROLLEN ZUM AUFWICKELN VON ELEKTROKABELN, STAHLKABELN, SEILEN, GLASFASERKABELN ODER DRAHTÄHNLICHEN ELEMENTEN IM ALLGEMEINEN

MACHINE À CLOUER, EN PARTICULIER POUR L'ASSEMBLAGE DE BRIDES DE BOBINES EN BOIS POUR CÂBLES ÉLECTRIQUES, CÂBLES D'ACIER, CORDES, CÂBLES À FIBRES OPTIQUES OU ÉLÉMENTS FILIFORMES EN GÉNÉRAL

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

(30) Priority: **04.06.2014 IT MI20141025**

(43) Date of publication of application:
09.12.2015 Bulletin 2015/50

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- **DATABASE WPI Week 198310 October 1983 (1983-10) Thomson Scientific, London, GB; AN 1983-D3684K XP002735014, -& SU 923 823 A1 (FERROUS METAL MECH) 30 April 1982 (1982-04-30) & WPI WORLD PATENT INFORMATION DERWENT, vol. 1983, no. 10, October 1983 (1983-10), XP002138853,**

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Description

[0001] The present invention relates to a nailing machine, particularly for assembling flanges of wooden spools for winding electrical cables, steel cables, ropes, fiber optic cables or wire-like elements in general according to the preamble of claim 1. Such a machine is disclosed by EP 1 716 996 A1. As is known, wooden spools used mainly to wind electrical cables, but also to wind steel cables, ropes, fiber optic cables or wire-like elements in general are composed of a cylindrical core, to the axial ends of which two flanges are fixed which delimit axially the space available for winding. The flanges of winding spools are each composed of two layers of wood strips, which are superimposed, and the strips of one layer are oriented at right angles to the strips of the other layer.

[0002] The process for the production of these flanges provides for a step of composing the two layers of strips, a step of assembly by nailing the strips of the two layers to each other and a step of cutting the two assembled layers so as to obtain the circular plan shape of the flanges.

[0003] Flanges of this type are manufactured by using nailing machines that comprise substantially: a station for composing the flange to be assembled, a nailing station and a resting and sliding surface, which is usually horizontal and is extended from the composition station to the nailing station and along which the two layers of strips that compose the flange to be assembled are moved.

[0004] At the nailing station there is at least one row of nailing clamps, generally two rows of nailing clamps. The row or rows of nailing clamps are oriented at right angles to the direction along which the flange to be assembled is moved from the composition station to the nailing station.

[0005] Before nailing, the strips of the two layers are compacted by means of adapted compaction elements, which are supported by a structure that can rotate about a vertical axis which, when the flange to be assembled is in the nailing station, coincides with the center of the flange to be assembled. The assembly of the two layers of strips that compose the flange to be assembled is performed by operating a plurality of times the nailing clamps and by rotating through angles of preset breadth the flange to be assembled about its own axis while the compaction elements maintain their action on the strips of the two layers.

[0006] Substantially, upon each operation of the nailing clamps, the machine applies two rows of nails that are mutually parallel and are oriented transversely to the advancement direction along which the flange has been moved from the composition station to the nailing station and after each operation the flange is rotated about its own axis through an angle of preset breadth. When the flange has been rotated in total through 180° about its own axis, the assembly method is complete.

[0007] A few nailing sequences are necessary in order to achieve the fixing of all the strips of one layer to the strips of the other layer and therefore, during these nailing sequences, it is necessary to maintain the strip compaction action on the part of the compaction elements. As a consequence of this requirement, it is necessary to rotate the compaction elements and the structure that supports them together with the flange to be assembled.

[0008] The rotation of the supporting structure and of the compaction elements is a source of problems and drawbacks.

[0009] This structure is in fact necessarily bulky and therefore its rotation is difficult.

[0010] Furthermore, the locking elements are difficult to adjust in order to be adapted to be used for the manufacture of flanges of various diameters.

[0011] Another drawback, which arises from the space occupation of the structure used to turn the flange about its own axis, is constituted by the need to also provide the framework that supports the large nailing clamps.

[0012] These problems and drawbacks affect the overall costs of machines of this type, which are high.

[0013] Furthermore, these machines require long times in order to change the format of the flanges being manufactured.

[0014] The aim of the present invention is to solve the problems and obviate the drawbacks described above, by providing a nailing machine, particularly for assembling flanges of wooden spools for winding electrical cables, steel cables, ropes, fiber optic cables or wire-like elements in general, that allows to reduce the time required to assemble the flanges and is simpler than machines of the known type both in terms of construction and in terms of actuation.

[0015] Within this aim, an object of the invention is to provide a machine that does not require to maintain the action of compaction of the strips that compose the flange during rotation about its own axis in order to complete the nailing operation.

[0016] Another object of the invention is to provide a machine that can be automated in a relatively simple manner in order to allow to pass from one flange format to another in much shorter times than currently commercially available machines.

[0017] Another object of the invention is to provide a machine that can be manufactured at competitive costs.

[0018] A further object of the invention is to provide a machine that ensures high safety and reliability in operation.

[0019] This aim, as well as these and other objects that will become better apparent hereinafter, are achieved by a nailing machine, particularly for assembling flanges of wooden spools for winding electrical cables, steel cables, ropes, fiber optic cables or wire-like elements in general, comprising:

- a station for composing a flange of a spool to be assembled;

- a nailing station;
- means for supporting the flange to be assembled on a substantially horizontal plane;
- means for the advancement of the flange to be assembled from said composition station to said nailing station along an advancement direction, said flange to be assembled being composed of two layers of strips in which the strips of one layer are oriented at right angles to said advancement direction and the strips of the other layer are oriented parallel to said advancement direction;
- means for compacting the strips of said two layers respectively along a direction that is parallel to said advancement direction and along a direction that is perpendicular to said advancement direction;
- nailing means, arranged at said nailing station;
- means for rotating said flange to be assembled about its own axis, which is oriented substantially vertically, said means being arranged at said nailing station;

characterized in that said nailing means comprise at least two rows of nailing clamps, which are oriented at right angles to each other, respectively at least one first row of nailing clamps that is oriented parallel to said advancement direction and at least one second row of nailing clamps that is oriented at right angles to said advancement direction.

[0020] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the machine according to the invention, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a schematic perspective view of the machine according to the invention, with some components omitted for the sake of simplicity and greater clarity and with a flange to be assembled arranged at the nailing station;

Figure 2 is a schematic perspective view of a part of the machine according to the invention at the nailing station with a flange to be assembled;

Figure 3 is a schematic perspective view of the nailing clamps of the machine according to the invention and of the corresponding supporting structure;

Figure 4 is a schematic perspective view of the same part of the machine shown in Figure 2, seen from a different angle and with the flange to be assembled removed;

Figure 5 is a schematic perspective view of a part of the machine related to the nailing clamps and to the elements that actuate them with a flange to be assembled arranged in the nailing station;

Figure 6 is a schematic perspective view of a part of the machine related to the means for rotating the flange to be assembled about its own axis;

Figure 7 is a front elevation view of a part of the means for rotating the flange to be assembled about

its own axis;

Figure 8 is a sectional perspective view of Figure 7, taken along the line VIII-VIII;

Figure 9 is a sectional view of Figure 7, taken along the line IX-IX;

Figure 10 is a schematic perspective view of another part of the machine according to the invention related to the elements for actuating the nailing clamps;

Figure 11 is a rear elevation view of a detail of the nailing clamp actuation elements;

Figure 12 is a sectional view of Figure 11, taken along the line XII-XII;

Figure 13 is a sectional perspective view of Figure 11, taken along the line XIII-XIII;

Figure 14 is a perspective view of a part of the machine at the nailing station, similar to Figure 4 but in a different operating condition;

Figure 15 is an enlarged-scale perspective view of a detail of the compaction means;

Figure 16 is a top plan view of the same detail of Figure 15;

Figure 17 is a perspective sectional view of Figure 16, taken along the line XVII-XVII;

Figure 18 is a sectional view of Figure 16, taken along the line XVIII-XVIII;

Figure 19 is a sectional view of Figure 18, taken along the line XIX-XIX;

Figure 20 is a view of the same detail as Figure 15 in a different operating condition;

Figure 21 is a top plan view of the same detail of Figure 20 in the same operating condition;

Figure 22 is a sectional perspective view of Figure 21, taken along the line XXII-XXII;

Figure 23 is a sectional view of Figure 21, taken along the line XXIII-XXIII;

Figure 24 is a sectional view of Figure 23, taken along the line XXIV-XXIV.

[0021] With reference to the figures, the machine according to the invention, designated generally by the reference numeral 1, comprises a station 2 for composing a spool flange to be assembled 3 (hereinafter simply "flange 3"), a nailing station 4, means 5 for supporting the flange 3 on a substantially horizontal plane, and means 6 for the advancement of the flange 3 from the composition station 2 to the nailing station 4 along an advancement direction, designated by the arrow 7.

[0022] The flange 3 is composed, in a per se known manner, by superimposing two layers of strips 8a, 8b arranged side by side, with the strips 8a of one layer oriented at right angles to the advancement direction 7 and the strips 8b of the other layer oriented parallel to the advancement direction 7.

[0023] The machine according to the invention is provided with means 9 for compacting the strips 8a, 8b that compose these two layers, respectively along a direction that is parallel to the advancement direction 7 and along a direction that is perpendicular to the advancement di-

rection 7 or along directions that are parallel to the direction of side-by-side arrangement of the strips 8a, 8b in the corresponding layer.

[0024] At the nailing station 4 there are nailing means 10 and means 11 for rotating the flange 3 about its own axis, which is oriented substantially vertically.

[0025] According to the invention, the nailing means 10 comprise at least two rows 12a, 12b, 13a, 13b of nailing clamps 14, which are oriented at right angles to each other, respectively at least one first row 12a, 12b of nailing clamps 14, which is oriented parallel to the advancement direction 7, and at least one second row 13a, 13b of nailing clamps 14, which is oriented at right angles to the advancement direction 7.

[0026] More particularly, the at least two rows 12a, 12b, 13a, 13b of nailing clamps 14 are arranged in a cross-like pattern that is centered on a main vertical axis 15 at which the axis of the flange 3 is arranged when said flange is placed at the nailing station 4.

[0027] The nailing machine according to the invention comprises a main supporting structure 16, which is provided with ground resting feet, and the supporting means 5 are constituted by bars 17 that are fixed to the main supporting structure 16 and define a substantially horizontal resting and sliding surface 18 for the flanges 3 to be assembled. The bars 17 extend from the composition station 2 to the nailing station 4.

[0028] The advancement means 6 comprise a first pusher 19, constituted by a flap, which is fixed transversely to a pair of chains 20 (only one of which is visible in Figure 4 and is shown schematically), which are arranged side by side and parallel to the bars 17, and is adapted to protrude upwardly from the resting and sliding surface 18. The first pusher 19 can engage the flange 3 arranged at the composition station 2 and can move on command along the advancement direction 7 so as to push the flange 3 from the composition station 2 to the nailing station 4.

[0029] Substantially, the chains 20 to which the first pusher 19 is fixed are arranged on substantially vertical planes that are parallel to the advancement direction 7, so that when the first pusher 19 is along the upper portion of the chains 20 it protrudes upwardly from the resting and sliding surface 18, while when it is along the lower portion of the chains 20 it is arranged below the resting and sliding surface 18, so as to not interfere with the flange 3 during its composition while the first pusher 19 is returned from the nailing station 4 to the composition station 2.

[0030] The chains 20 to which the first pusher 19 is fixed engage pinions 21, the axes of which are arranged horizontally and are oriented at right angles to the advancement direction 7. One of the pinions 21 is connected to the output shaft of a corresponding gearmotor, not visible in the figures, which can be operated in order to actuate the chains 20 to which the first pusher 19 is fixed.

[0031] It should be noted that in the various accompanying figures the chains of the chain connections that are

provided in the machine according to the invention are shown schematically, in some cases without showing in details the links that compose them, in other cases by showing in detail only some of the links that compose them and in further cases simply with a dot-and-dash line. Moreover, it should be noted that in some chain connections the chains have been omitted for the sake of simplicity and greater clarity.

[0032] The compaction means 9 comprise: the first pusher 19, a second pusher 23, which is arranged at the nailing station 4 and can move from an inactive position, in which it is arranged below the resting and sliding surface 18 so as to not interfere with the flange 3, as shown for example in Figure 4, to an active position, in which it protrudes upwardly from the resting and sliding surface 18 on the opposite side with respect to the first pusher 19, as shown for example in Figures 2 and 14, so as to engage against the side of the flange 3 that is opposite with respect to the side engaged by the first pusher 19.

[0033] The compaction means 9 also comprise a third pusher 24, which is arranged at the nailing station 4 and is adapted to protrude above the resting and sliding surface 18, and a fourth pusher 25, which also is arranged at the nailing station 4 and is adapted to protrude above the resting and sliding surface 18. The third pusher 24 and the fourth pusher 25 are mutually opposite along a direction that is perpendicular to the advancement direction 7 and can move on command toward or away from each other.

[0034] More particularly, the second pusher 23 also is constituted by a flap and is fixed to a corresponding pair of chains 26, which are arranged on vertical planes parallel to the bars 17. The second pusher 23 can engage the side of the flange 3 that is opposite with respect to the side engaged by the first pusher 19 when the flange 3 is arranged at the nailing station 4. The second pusher 23, by way of the actuation of the chains 23 to which it is fixed, can be moved above the resting and sliding surface 18, as shown for example in Figures 2 and 14, or below the resting and sliding surface 18, as shown for example in Figure 4.

[0035] Substantially, the chains 26 to which the second pusher 23 is fixed are arranged downstream of the chains 20 to which the first pusher 19 is fixed and engage corresponding pinions 27, the axes of which are arranged horizontally and are oriented at right angles to the advancement direction 7. One of the pinions 27 is connected to the output shaft of a corresponding gearmotor, not shown in the figures, which can be actuated in order to actuate the chains 26 to which the second pusher 23 is fixed.

[0036] The third pusher 24 is constituted again by a flap and is fixed to a corresponding pair of chains 29, which are arranged, on vertical planes, at right angles to the bars 17. The third pusher 24 can engage one of the sides of the flange 3 that are parallel to the advancement direction 7, i.e., perpendicular to the sides with which they engage the first pusher 19 and the second pusher

23, when the flange 3 is arranged at the nailing station 4. The third pusher 24, by way of the actuation of the chains 29 to which it is fixed, can be moved above the resting and sliding surface 18, as shown for example in Figures 2 and 14, or below the resting and sliding surface 18, as shown for example in Figure 4.

[0037] Substantially, the chains 29 to which the third pusher 24 is fixed are arranged laterally to a vertical central plane of the machine that is parallel to the advancement direction 7 and passes through the main axis 15 and engage corresponding pinions 30, the axes of which are arranged horizontally and are oriented parallel to the advancement direction 7. One of the pinions 30 is connected to the output shaft of a corresponding gearmotor 31, which can be actuated in order to actuate the chains 29 to which the third pusher 24 is fixed.

[0038] In turn, the fourth pusher 25 is constituted by a flap and is fixed to a corresponding pair of chains 32 arranged on vertical planes at right angles to the bars 17. The fourth pusher 25 can engage the side of flange 3 that is opposite with respect to the side that the third pusher 24 engages when the flange 3 is arranged at the nailing station 4. The fourth pusher 25, by way of the actuation of the chains 32 to which it is fixed, can be moved above the resting and sliding surface 18, as shown for example in Figures 2 and 14, or below the resting and sliding surface 18, as shown for example in Figure 4.

[0039] The chains 32 to which the fourth pusher 25 is fixed are arranged laterally to the vertical central plane of the machine on the opposite side with respect to the chains 29 of the third pusher 24 and engage corresponding pinions 33, the axes of which are arranged horizontally and are oriented parallel to the advancement direction 7. One of the pinions 33 is connected to the output shaft of a corresponding gearmotor 34, which can be actuated in order to actuate the chains to which the fourth pusher 25 is fixed.

[0040] The pinions 27, 30, 33 with which the chains 26, 29, 32 engage are supported by corresponding supporting structures 35, 36, 37, which are fixed to the main supporting structure 16, to which side walls 35a, 36a, 37a are fixed which, with their upper side, cooperate with the upper side of the bars 17 in defining the resting and sliding surface 18. The pair of pinions 21 with which the chains 20 of the first pusher 19 engage, proximate the nailing station 4, also is supported by a corresponding supporting structure 38, which is fixed to the main supporting structure 16 and is provided with side walls 38a which, with their upper side, cooperate with the upper side of the bars 17 in defining the resting and sliding surface 18.

[0041] Conveniently, at least one between the first pusher 19 and the second pusher 23 has, on its face intended to engage the flange 3, a first protruding tooth 39 which is arranged in a manner adapted to engage one layer of the two layers of strips 8a, 8b that compose the flange 3. In the illustrated embodiment, there is a first

tooth 39, which is fixed to the second pusher 23 and is intended to engage the strips 8a of the lower layer that compose the flange 3.

[0042] Likewise, at least one between the third pusher 24 and the fourth pusher 25 has, on its face intended to engage the flange 3, a second protruding tooth 40, which is arranged in a manner adapted to engage with the other layer of the two layers of strips 8a, 8b that compose the flange 3. In the illustrated embodiment there is a second tooth 40, which is fixed to the fourth pusher 25 and is intended to engage the strips 8b of the upper layer that compose the flange 3.

[0043] Conveniently, the machine according to the invention comprises riveters which are arranged in the nailing station 4 below the nailing clamps 14.

[0044] These riveters are constituted by four riveters 41, 42, 43, 44, which, in a manner similar to the rows 12a, 12b and 13a, 13b of nailing clamps 14, are arranged in a cross-like pattern radially with respect to the main axis 15.

[0045] Each one of the riveters 41, 42, 43, 44 is constituted by a plate that is arranged horizontally and preferably has, on its upper face, a plurality of knurlings so as to increase adhesion to the tip of the nails. Each riveter is arranged between the side walls 38a, 35a, 36a, 37a that support the pinions 21, 27, 30, 33 and externally to which the chains 20, 26, 29, 32 are arranged.

[0046] Preferably each one of the riveters 41, 42, 43, 44 can move on command vertically and parallel to the direction along which the row or rows 12a, 12b, 13a, 13b of nailing clamps 14, below which it is arranged, is extended.

[0047] More particularly, the two riveters 43, 44 arranged between the side walls 36a and between the side walls 37a, which support respectively the pinions 30, 33 of the chains 29, 32 of the third pusher 24 and of the fourth pusher 25, are mutually aligned along a direction that is perpendicular to the advancement direction 7 and can move on command vertically and at right angles to the advancement direction 7, while the other two riveters 41, 42, which are arranged between the side walls 38a and between the side walls 35a, which support respectively the pinions 21 of the chains 20 of the first pusher 19 and the pinions 27 of the chains 26 of the second pusher 23, are mutually aligned along a direction that is parallel to the advancement direction 7, more precisely along the central axis of the machine, and can move on command vertically and parallel to the advancement direction 7.

[0048] This movement of the riveters 41, 42, 43, 44 is achieved by connecting each riveter to a corresponding gearmotor via a crank connection 60.

[0049] Figures 15 to 24 illustrate the riveter 44, arranged between the side walls 37a, which is actuated by means of the corresponding gearmotor 45.

[0050] The gearmotor 45 is fixed, by means of its body, to the supporting structure 37 to which the side walls 37a, between which the riveter 44 is arranged, are fixed.

[0051] By way of the vertical movement of the riveters 41, 42, 43, 44 it is possible to move the upper face of the riveters 41, 42, 43, 44 into a position that is substantially coplanar with the upper side of the side walls 38a, 35a, 36a, 37a, as shown for example in Figures 15 to 19, or below the upper side of the side walls 38a, 35a, 36a, 37a, as shown for example in Figures 20 to 24, so as to allow the resting of the flange 3, with its lower face, on the upper side of the side walls 38a, 35a, 36a, 37a.

[0052] By way of the movement of the riveters 41, 42 parallel to the advancement direction 7 and of the riveters 43, 44 at right angles to the advancement direction 7, the bending and therefore the riveting of the nails is produced during the nailing operation performed by the nailing clamps 14.

[0053] It should be noted that the three assemblies constituted by the second pusher 23, by the third pusher 24 and by the fourth pusher 25 with the corresponding actuation elements, with the riveter 42, 43, 44 arranged between the side walls 35a, 36a, 37a and with the corresponding gearmotor for the actuation of the riveter 42, 43, 44, can be constituted by three modules that are substantially mutually identical. For the sake of simplicity, Figures 15 to 24 show in detail only the module that supports the fourth pusher 25.

[0054] The module that supports the riveter 41 can be provided in a manner similar to these three modules, with the difference that the chains 20, instead of being limited to the module, are extended to the composition station 2.

[0055] Preferably, in the machine according to the invention there are two pairs of rows 12a, 12b and 13a, 13b of nailing clamps 14, respectively: a first pair of rows 12a, 12b of nailing clamps 14, which are oriented parallel to the advancement direction 7, and a second pair of rows 13a, 13b of nailing clamps 14, which are oriented at right angles to the advancement direction 7.

[0056] Furthermore, there are means 46 for varying the individual position of the nailing clamps 14 parallel to the direction along which the corresponding row of nailing clamps 14 is extended.

[0057] More particularly, the nailing clamps 14 are mounted on a corresponding supporting structure 47, which is arranged at the nailing station 4 above the resting and sliding surface 18. The supporting structure 47 of the nailing clamps 14 can move vertically with respect to the resting and sliding surface 18 and is surmounted by an actuation structure 48 or hammer, to which it is coupled.

[0058] In turn, the actuation structure 48 is supported by two shoulders 49, 50 and can move on command vertically, with an actuation stroke, downwardly so as to actuate the strikers 51 of the nailing clamps 14 and upwardly so as to space the nailing clamps 14 above the resting and sliding surface 18.

[0059] More particularly, the supporting structure 47 of the nailing clamps 14 has a plan shape substantially diamond-like with cut corners, i.e., octagonal, and supports the two pairs of rows 12a, 12b, 13a, 13b of nailing clamps

14 that are arranged proximate to the diagonals of the diamond. Each row 12a, 12b, 13a, 13b of nailing clamps 14 is mounted on a corresponding threaded shaft 52a, 52b, 53a, 53b. The two threaded shafts 52a, 52b that support the two rows 12a, 12b of nailing clamps 14 oriented parallel to the advancement direction 7 are supported, so as to be able to rotate about the corresponding axes, which are parallel to the advancement direction 7, by the supporting structure 47, and are mutually connected, in rotation about the corresponding axes, by means of a pinions-and-chain connection 54, which is arranged at an axial end thereof. One of these threaded shafts, constituted in the illustrated embodiment by the threaded shaft 52a, is connected, by means of its opposite axial end, to a gearmotor 55, which can be operated in order to turn the threaded shafts 52a, 52b.

[0060] Likewise, the two threaded shafts 53a, 53b that support the two rows 13a, 13b of nailing clamps 14 oriented at right angles to the advancement direction 7 are supported, so that they can rotate about the corresponding axes, which are perpendicular to the advancement direction 7, by the supporting structure 47, and are mutually connected in rotation about the corresponding axes by means of a pinions-and-chain connection 56, which is arranged at an axial end thereof. In this case also, one of these threaded shafts, constituted in the illustrated embodiment by the threaded shaft 53a, is connected, by means of its opposite axial ends, to a gearmotor 57, which can be activated in order to turn the threaded shafts 53a, 53b.

[0061] The means 46 for varying the position of each nailing clamp 14 along the direction along which the row 12a, 12b, 13a, 13b to which it belongs is extended comprise the corresponding threaded shaft 52a, 52b, 53a, 53b, a female thread, not shown in the figures, which engages the threaded shaft 52a, 52b, 53a, 53b and is supported, so that it can rotate about the axis of the same threaded shaft 52a, 52b, 53a, 53b inside the body of the corresponding nailing clamp 14. On the body of each nailing clamp 14 there is a corresponding fluid-operated cylinder 58, which can be actuated on command in order to engage, by means of the stem of its piston, said female thread so as to lock it with respect to the body of the nailing clamp 14. Substantially, when the female thread is free to rotate about the axis of the corresponding threaded shaft 52a, 52b, 53a, 53b with respect to the body of the corresponding nailing clamp 14, the rotation of the threaded shaft 52a, 52b, 53a, 53b has no effect on the position of this nailing clamp 14, while when the female thread is locked with respect to the body of the nailing clamp 14 as a consequence of the actuation of the fluid-operated cylinder 58 the rotation of the corresponding threaded shaft 52a, 52b, 53a, 53b produces a movement, in one direction or in the opposite direction, depending on the direction of rotation of the threaded shaft 52a, 52b, 53a, 53b, along said threaded shaft 52a, 52b, 53a, 53b.

[0062] The nailing clamps 14 can be constituted by

nailing clamps 14 of a known type, with a body to which a channel 59 for feeding the nails is connected and with a striker 51 that protrudes from the upper side of the body of the corresponding nailing clamp 14 and can be actuated downwardly in order to actuate in each instance the expulsion of a nail from the lower side of the corresponding nailing clamp 14.

[0063] The supporting structure 47 of the nailing clamps 14 hangs from the overlying actuation structure 48 by means of two tension members 61, 62. The connection between the supporting structure 47 of the nailing clamps 14 and the actuation structure 48 by means of the two tension members 61, 62 is provided so that, when the nailing clamps 14 rest against the upper face of the flange 3 at the nailing station 4, the actuation structure 48 can descend further with respect to the supporting structure 47 of the nailing clamps 14 so as to act on the upper end of the strikers 51 in order to push them downwardly so that they drive the nails into the flange 3 and so that when the actuation structure 48 is lifted, beyond a first extent required in order to allow the rearming of the strikers 51, it drags upwardly also the supporting structure 47 of the nailing clamps 14 so as to space it above the flange 3 arranged in the nailing station 4.

[0064] The supporting structure 47 of the nailing clamps 14 is guided, in its vertical motion, by wheels 63, which slide along guides 64 that are applied to the two shoulders 49, 50 which support also the actuation structure 48 so that it can slide along the vertical direction.

[0065] The actuation structure 48 is constituted by a substantially cross-shaped beam, in a manner similar to the arrangement of the rows 12a, 12b, 13a, 13b of nailing clamps 14, so as to engage, with its lower side, against the upper end of the strikers 51 of the nailing clamps 14 during its lowering along the shoulders 49, 50.

[0066] The vertical movement of the actuation structure 48 is actuated by means of a gearmotor 65 which is connected, by means of its output shaft, to a main actuation shaft 66 by means of a chain connection, of which only the pinions 67 have been shown. The main actuation shaft 66 is supported, so that it can rotate about its own axis, which is oriented at right angles to the advancement direction 7, by the shoulders 49, 50.

[0067] The main actuation shaft 66 is connected, with each of its axial ends, to the actuation structure 48 by means of a transmission constituted by a rod 68 and a crank 69.

[0068] The upper end of each one of the rods 68 is hinged to a block 70, which is supported by the actuation structure 48 in a manner that allows vertical sliding.

[0069] Advantageously, there are means for adjusting the height position 71 of the actuation structure 48 and therefore of the supporting structure 47 of the nailing clamps 14 as a function of the thickness of the flange 3 to be assembled. These adjustment means comprise, for each block 70, a gearmotor 72, which is connected, by means of its output shaft, to a threaded shaft 73 that mates with a female thread 74 arranged inside the block

70. The body of the gearmotor 72 is fixed to the actuation structure 48 so that the actuation of the gearmotors 72 produces the vertical movement of the actuation structure 48 with respect to the block 70.

[0070] In this manner, by means of the actuation of the gearmotors 72 it is possible to vary the height position of the actuation structure 48 independently of its actuation stroke imposed by the connection with a rod 68 and a crank 69 that exists between the main actuation shaft 66 and the actuation structure 48.

[0071] The two shoulders 49, 50 are fixed by means of their base to the main supporting structure 16 and are mutually connected, proximate to their upper end, by two crossmembers 75, 76, which are perpendicular to the advancement direction 7, thus providing a sort of portal, which is located at the nailing station 4 and through which the flange 3 is made to pass.

[0072] The rotation means 11 comprise a lower shaft 77, which has a vertical axis and is provided, at its upper end, with a lower claw 78 and with an upper shaft 79, which is arranged coaxially to the lower shaft 77 and is provided, at its lower end, with an upper claw 80. The lower shaft 77 and the upper shaft 79 are arranged with their axis at the main axis 15.

[0073] The lower shaft 77 and the upper shaft 79 can move along the corresponding axis, i.e., along the main axis 15, in order to engage, by means of the claws 78, 80, respectively the lower face and the upper face of the flange 3 that is arranged in the nailing station 4 or disengage from said flange 3.

[0074] Both the lower shaft 77 and the upper shaft 79 can rotate about the common axis, i.e., about the main axis 15, in order to turn the flange 3 about its own axis.

[0075] More particularly, the lower shaft 77 is supported, so that it can rotate freely about its own axis and so that it can slide along said axis, by a part of the main supporting structure 16.

[0076] The lower shaft 77 is connected to the stem of the piston of a fluid-operated cylinder 81, which can be actuated in order to translate the lower shaft 77 along its own axis with respect to the main supporting structure 16.

[0077] The upper shaft 79 is supported, so that it can rotate about its own axis and so that it can slide along said axis, by a corresponding supporting structure 82, which is connected, as will become better apparent hereinafter, to one of the crossmembers 75, 76 that mutually connect the two shoulders 49, 50.

[0078] More particularly, the upper shaft 79 is supported by the supporting structure 82 by means of a pair of bearings 83 and is fixed, with its upper end, to the output shaft of a gearmotor 84, which is mounted on the supporting structure 82 and can be actuated in order to turn about its own axis the upper shaft 79 with respect to the supporting structure 82.

[0079] In turn, the supporting structure 82 is supported so that it can slide along vertical guides 85, which are fixed to a framework 86 that is fixed to the crossmember 75. The body of a fluid-operated cylinder 87 having a

vertical axis is fixed to said framework 86 and is connected by means of the stem of its piston to the supporting structure 82 and can be actuated in order to move the supporting structure 82 along a vertical direction and therefore to translate the upper shaft 79 along its axis with respect to the crossmember 75.

[0080] The supporting structure 82 has a substantially cylindrical enclosure 82a, which protrudes downwardly and accommodates much of the upper shaft 79. The enclosure 82a, with the upper shaft 79, passes through a hole 88, which is provided conveniently at the intersection of the branches that compose the actuation structure 48, i.e., at the main axis 15.

[0081] The force generated by the fluid-operated cylinder 81 that actuates the translation of the lower shaft 77 is conveniently greater than the force generated by the fluid-operated cylinder 87 that actuates the translation of the upper shaft 79, so that the flange 3, when it is engaged, by means of the actuation of the fluid-operated cylinders 81, 87, of the lower jaw 78 and of the upper jaw 80, is raised slightly with respect to the resting and sliding surface 18, so as to facilitate its rotation about its own axis as a consequence of the rotation of the lower shaft 77 and of the upper shaft 79 about the common axis, i.e., about the main axis 15.

[0082] The machine is completed, downstream of the nailing station 4, along the advancement direction 7, by removal means constituted by a conveyor 89, for example a chain conveyor of a known type, which constitutes an extension of the resting and sliding surface 18 defined by the bars 17 and by means of which the flange 3, once nailed, is moved away from the nailing station 4.

[0083] For the sake of completeness in description, it should be noted that the machine can be provided with a control and actuation element, of the programmable electronic type, which is connected to the various gearmotors and fluid-operated cylinders described above and to other actuation and/or control elements, of a known type and not described for the sake of simplicity, which are mounted on the machine, and can be actuated, according to preset programs, so as to control and monitor the operation of the machine.

[0084] Operation of the nailing machine according to the invention is as follows.

[0085] The flange 3 to be assembled is composed at the composition station 2 by arranging on the resting and sliding surface 18 a first layer of strips 8a that are oriented at right angles to the advancement direction 7 and by superimposing on the latter a second layer of strips 8b that are oriented parallel to the advancement direction 7.

[0086] The flange 3 thus composed is transferred, by means of the first pusher 19 actuated by the chains 20, from the composition station 2 to the nailing station 4, stopping the flange 3 with its axis at the main axis 15. The correct placement of the flange 3 in the nailing station 4 is achieved by placing the second pusher 23, which by cooperating with the first pusher 19 also compacts the strips 8a of the lower layer along a direction that is parallel

to the advancement direction 7.

[0087] At this point, the other compaction means 9 are actuated, i.e., the third pusher 24 and the fourth pusher 25 are actuated and engage the upper layer of strips 8b, performing their compaction along a direction that is perpendicular to the advancement direction 7.

[0088] It should be noted that the presence of the teeth 39, 40 allows to achieve effective compaction of the two layers of strips 8a, 8b, preventing hindrance of the correct compaction of the other layer if one of the two layers has larger dimensions along one of the above cited directions.

[0089] With the layers of strips 8a, 8b thus compacted, the actuation structure 48 is actuated downwardly and causes the resting of the nailing clamps 14 against the upper face of the flange 3. As a consequence of this resting, the supporting structure 47 of the nailing clamps 14 stops its descent, while the actuation structure 48 continues its downward motion, actuating the strikers 51 of the nailing clamps 14, which drive one nail for each nailing clamp 14 into the flange 3.

[0090] During the execution of nailing, the riveters 41, 42, 43, 44 are actuated so as to perform the riveting bending of the nails.

[0091] The particular arrangement of the nailing clamps 14 according to the invention achieves the results of obtaining, already at the end of this first nailing operation, the mutual connection of the various strips 8a, 8b that compose the two layers. Thanks to this fact, the flange 3 no longer needs to be kept under the action of the compaction means 9.

[0092] At the end of the first nailing operation, the actuation structure 48 is again raised, lifting, after a first extent which has no effect, the supporting structure 47 of the nailing clamps 14 and therefore disengaging the nailing clamps 14 from the upper face of the flange 3.

[0093] At this point the fluid-operated cylinders 81, 87 of the rotation means 11 are actuated so as to cause the movement of the lower shaft 77 and of the upper shaft 79 along the common axis, i.e., along the main axis 15, respectively upwardly and downwardly so as to engage them, by means of the corresponding claws 78, 80, against the lower face and against the upper face of the flange 3. It should be noted that the different force generated by the fluid-operated cylinders 81, 87, as explained earlier, produces a slight rise of the flange 3 above the resting and sliding surface 18.

[0094] At this point, after spacing the pushers 19, 23, 24, 25 from the sides of the flange 3 and optionally moving the pushers 23, 24, 25 below the resting and sliding surface 18 so that they do not hinder the rotation of the flange 3 about its own axis, the gearmotor 84 is actuated and causes the rotation of the upper shaft 79 about its own axis, i.e., about the main axis 15 and consequently the rotation of the flange 3 about its own axis through an angle of preset breadth.

[0095] The flange 3, by acting on the fluid-operated cylinders 81, 87, is again lowered and rested on the rest-

ing and sliding surface 18.

[0096] The actuation structure 48 is then lowered again, in a manner similar to what has already been described in the preceding nailing step, performing a new nailing, which is angularly offset, about the main axis 15, with respect to the nailing performed previously.

[0097] One then proceeds as already described above, providing a plurality of nailing steps until the assembly of the flange 3 is completed.

[0098] It should be noted that the particular arrangement, according to the invention, of the nailing clamps 14 allows to complete the nailing of the flange 3 by rotating it about the main axis 15 through an angle of 90°, instead of through an angle of 180°, as instead occurs in nailing machines of the traditional type. Thanks to this fact, the time required to complete the assembly of the flange 3 is reduced.

[0099] Once the nailing operation has been completed, the nailing clamps 14 are disengaged upward from the flange 3, which, by means of the actuation of the first pusher 19 and by means of the actuation of the conveyor 89, after moving the second pusher 23 below the resting and sliding surface 18, is moved away from the nailing station 4 in order to make room for a new flange 3 to be assembled.

[0100] In practice it has been found that the nailing machine according to the invention achieves fully the intended aim, since thanks to the particular arrangement of the nailing clamps it allows to reduce the time required to assemble the flanges of wooden spools for winding electrical cables, steel cables, ropes, fiber optic cables or wire-like elements in general, with respect to nailing machines of the traditional type.

[0101] Furthermore, thanks to the fact that already at the end of the first nailing step, i.e., with a single nailing "beat", the strips of the two layers are mutually assembled, the machine according to the invention abolishes the need to perform rotation, together with the flange, of the compaction means, as instead occurs in nailing machines of the traditional type. This fact achieves the goal of simplifying the entire structure of the machine, allowing a reduction of overall production costs.

[0102] A further advantage of the nailing machine according to the invention is that it is possible to vary, in a completely automated manner, the position of the nailing clamps as well as the height position of the actuation structure of the nailing clamps independently of its stroke. Thanks to this fact it is possible to adapt the nailing machine to various flange formats extremely rapidly and without requiring manual interventions on the machine.

[0103] The nailing machine thus conceived is susceptible of numerous modifications and variations within the scope of the appended claims. In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0104] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increas-

ing 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 nailing machine, particularly for assembling flanges of wooden spools for winding electrical cables, steel cables, ropes, fiber optic cables or wire-like elements in general, comprising:

- a station (2) for composing a flange of a spool to be assembled (3);
- a nailing station (4);
- means (5) for supporting the flange to be assembled (3) on a substantially horizontal plane;
- means (6) for the advancement of the flange to be assembled (3) from said composition station (2) to said nailing station (4) along an advancement direction (7), said flange to be assembled (3) being composed of two layers of strips (8a, 8b) in which the strips (8a) of one layer are oriented at right angles to said advancement direction (7) and the strips (8b) of the other layer are oriented parallel to said advancement direction (7);
- means (9) for compacting the strips (8a, 8b) of said two layers respectively along a direction that is parallel to said advancement direction (7) and along a direction that is perpendicular to said advancement direction (7);
- nailing means (10), arranged at said nailing station (4);
- means (11) for rotating said flange to be assembled (3) about its own axis, which is oriented substantially vertically, said means being arranged at said nailing station (4);

characterized in that said nailing means (10) comprise at least two rows (12a, 12b, 13a, 13b) of nailing clamps (14), which are oriented at right angles to each other, respectively at least one first row (12a, 12b) of nailing clamps (14) that is oriented parallel to said advancement direction (7) and at least one second row (13a, 13b) of nailing clamps (14) that is oriented at right angles to said advancement direction (7).

2. The machine according to claim 1, **characterized in that** said at least two rows (12a, 12b, 13a, 13b) of nailing clamps (14) are arranged along a cross that is centered on a vertical main axis (15) at which the axis of the flange to be assembled (3) in said nailing station (4) is positioned.

3. The machine according to claim 1, **characterized in**

that said supporting means (5) comprise bars (17) that define a substantially horizontal resting and sliding surface (18) for the flange to be assembled (3) and extend from said composition station (2) to said nailing station (4); said advancement means (6) comprising a first pusher (19) adapted to protrude upwardly from said resting and sliding surface (18); said first pusher (19) being engageable with the flange to be assembled (3) and being movable on command along said advancement direction (7) in order to push said flange to be assembled (3) from said composition station (2) to said nailing station (4).

4. The machine according to one or more of the preceding claims, **characterized in that** said compaction means (9) comprise:

- said first pusher (19);
- a second pusher (23), which is arranged at said nailing station (4) and can move from an inactive position, in which it is arranged below said resting and sliding surface (18) so as to not interfere with said flange to be assembled (3), to an active position, in which it protrudes upwardly from said resting and sliding surface (18) on the opposite side with respect to said first pusher (19) in order to engage against the side of said flange to be assembled (3) that is opposite with respect to the side engaged by said first pusher (19);
- a third pusher (24), which is arranged at said nailing station (4) and is adapted to protrude upwardly from said resting and sliding surface (18);
- a fourth pusher (25), which is arranged at said nailing station (4) and is adapted to protrude upwardly from said resting and sliding surface (18);
- said third pusher (24) and said fourth pusher (25) being mutually opposite along a direction that is perpendicular to said advancement direction (7) and being movable on command toward or away from each other.

5. The machine according to claim 4, **characterized in that** at least one between said first pusher (19) and said second pusher (23) has, on its side that can engage the flange to be assembled (3), a first tooth (39) that protrudes toward the opposite pusher (23 or 19) and can engage one of the two layers of strips (8a, 8b) that compose the flange to be assembled (3), and **in that** at least one between said third pusher (24) and said fourth pusher (25) has, on its side that can engage the flange to be assembled (3), a second tooth (40) that protrudes toward the opposite pusher (25 or 24) and can engage the other one of the two layers of strips (8a, 8b) that compose the flange to be assembled (3).

6. The machine according to one or more of the preceding claims, **characterized in that** said at least

two rows (12a, 12b, 13a, 13b) of nailing clamps (14) comprise two pairs of rows (12a, 12b, 13a, 13b) of nailing clamps (14), respectively: a first pair of rows (12a, 12b) of nailing clamps (14) oriented parallel to said advancement direction (7) and a second pair of rows (13a, 13b) of nailing clamps (14) oriented at right angles to said advancement direction (7).

7. The machine according to one or more of the preceding claims, **characterized in that** it comprises means (46) for varying the individual position of said nailing clamps (14) parallel to the direction along which the corresponding row (12a, 12b, 13a, 13b) of nailing clamps (14) is extended.

8. The machine according to claim 3, **characterized in that** it comprises a structure (47) for supporting said nailing clamps (14) that is arranged at said nailing station (4) above said resting and sliding surface (18); said supporting structure (47) of the nailing clamps (14) being movable vertically with respect to said resting and sliding surface (18) and being surmounted by an actuation structure or hammer (48) to which it is coupled; said actuation structure (48) being movable on command vertically, with an actuation stroke, downwardly to actuate the strikers (51) of said nailing clamps (14) and upwardly to space said nailing clamps (14) above said resting and sliding surface (18).

9. The machine according to claim 8, **characterized in that** said actuation structure (48) is supported slidably by two shoulders (49, 50) of a main supporting structure (16), means being provided for adjusting the height position (71) of said actuation structure (48) independently of said actuation stroke.

10. The machine according to one or more of claims 2 to 9, **characterized in that** said rotation means (11) comprise a lower shaft (77), which has a vertical axis and is provided, at its upper end, with a lower claw (78) and an upper shaft (79), which is arranged coaxially to said lower shaft (77) and is provided, at its lower end, with an upper claw (80); said lower shaft (77) and said upper shaft (79) being arranged so that their axis is at said main axis (15); said lower shaft (77) and said upper shaft (79) being movable along the corresponding axis in order to engage respectively the lower face and the upper face of the flange to be assembled (3) arranged in said nailing station (4) or to disengage from the flange to be assembled (3); said lower shaft (77) and said upper shaft (79) being rotatable about the common axis in order to rotate the flange to be assembled (3) about its own axis.

11. The machine according to claim 10, **characterized in that** said lower shaft (77) can rotate freely about

its own axis.

12. The machine according to claim 10 or 11, **characterized in that** said upper shaft (79) is connected to a corresponding gearmotor (84) that can be actuated in order to actuate the rotation of said upper shaft (79) about its own axis. 5
13. The machine according to one or more of the preceding claims, **characterized in that** it comprises riveters (41, 42, 43, 44) arranged in said nailing station (4) below said nailing clamps (14). 10
14. The machine according to claim 13, **characterized in that** said riveters (41, 42, 43, 44) are constituted by four riveters (41, 42, 43, 44) arranged in a cross-like pattern radially with respect to said main axis (15). 15
15. The machine according to claim 13 or 14, **characterized in that** each one of said riveters (41, 42, 43, 44) can move on command vertically and parallel to the direction along which the row or pair of rows (12a, 12b, 13 a, 13b) of nailing clamps (14), below which it is arranged, is extended. 20

Patentansprüche

1. Nagelmaschine, insbesondere zur Montage von Bündeln von Holzrollen zum Aufwickeln von Elektrokabeln, Stahlkabeln, Seilen, Glasfaserkabeln oder drahtähnlichen Elementen im Allgemeinen, die Folgendes umfasst: 30
 - eine Station (2) zum Zusammenbauen eines zu montierenden Bundes einer Rolle (3);
 - eine Nagelstation (4);
 - Mittel (5) zum Tragen des zu montierenden Bundes (3) auf einer im Wesentlichen horizontalen Ebene;
 - Mittel (6) zum Bewegen des zu montierenden Bundes (3) von der Zusammenbaustation (2) zu der Nagelstation (4) entlang einer Vorschubrichtung (7), wobei der zu montierende Bund (3) aus zwei Schichten von Streifen (8a, 8b) besteht, worin die Streifen (8a) einer Schicht in rechten Winkeln zu der Vorschubrichtung (7) ausgerichtet sind und die Streifen (8b) der anderen Schicht parallel zu der Vorschubrichtung (7) ausgerichtet sind; 40
 - Mittel (9) zum Zusammendrücken der Streifen (8a, 8b) der beiden Schichten entlang einer Richtung, die parallel zu der Vorschubrichtung (7) ist, beziehungsweise entlang einer Richtung, die senkrecht zu der Vorschubrichtung (7) ist; 45
 - Nagelmittel (10), angeordnet an der Nagelstation (4); 50

- Mittel (11) zum Drehen des zu montierenden Bundes (3) um seine eigene Achse, die im Wesentlichen vertikal ausgerichtet ist, wobei die Mittel an der Nagelstation (4) angeordnet sind;

dadurch gekennzeichnet, dass die Nagelmittel (10) mindestens zwei Reihen (12a, 12b, 13a, 13b) von Nagelklemmen (14) umfassen, die in rechten Winkeln zueinander ausgerichtet sind, mindestens eine erste Reihe (12a, 12b) von Nagelklemmen (14), die parallel zu der Vorschubrichtung (7) ausgerichtet ist, beziehungsweise mindestens eine zweite Reihe (13a, 13b) von Nagelklemmen (14), die in rechten Winkeln zu der Vorschubrichtung (7) ausgerichtet ist.

2. Die Maschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die mindestens zwei Reihen (12a, 12b, 13a, 13b) von Nagelklemmen (14) entlang einem Kreuz angeordnet sind, das auf einer vertikalen Hauptachse (15) zentriert ist, an welcher die Achse des Bundes (3), der in der Nagelstation (4) montiert werden soll, positioniert ist.

3. Die Maschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die tragenden Mittel (5) Stangen (17) umfassen, die eine im Wesentlichen horizontale Auflage- und Gleitfläche (18) für den zu montierenden Bund (3) bestimmen und sich von der Zusammenbaustation (2) zu der Nagelstation (4) erstrecken; wobei die Vorschubmittel (6) einen ersten Schieber (19) umfassen, der ausgebildet ist, um von der Auflage- und Gleitfläche (18) nach oben zu ragen; wobei der erste Schieber (19) mit dem zu montierenden Bund (3) in Eingriff stehen kann und auf Befehl entlang der Vorschubrichtung (7) beweglich ist, um den zu montierenden Bund (3) aus der Zusammenbaustation (2) in die Nagelstation (4) zu schieben. 35

4. Die Maschine gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die zusammendrückenden Mittel (9) Folgendes umfassen: 40

- den ersten Schieber (19);
- einen zweiten Schieber (23), der an der Nagelstation (4) angeordnet ist und sich aus einer inaktiven Position, in welcher er unterhalb der Auflage- und Gleitfläche (18) angeordnet ist, um den zu montierenden Bund (3) nicht zu behindern, in eine aktive Position bewegen kann, in welcher er aus der Auflage- und Gleitfläche (18) auf der dem ersten Schieber (19) gegenüberliegenden Seite nach oben herausragen kann, um mit der Seite des zu montierenden Bundes (3) in Eingriff zu stehen, die der Seite gegenüberliegt, die mit dem ersten Schieber (19) in Eingriff 45

- steht;
- einen dritten Schieber (24), welcher an der Nagelstation (4) angeordnet und ausgebildet ist, um aus der Auflage- und Gleitfläche (18) nach oben herauszuragen;
 - einen vierten Schieber (25), der an der Nagelstation (4) angeordnet und ausgebildet ist, um aus der Auflage- und Gleitfläche (18) nach oben herauszuragen;
 - wobei der dritte Schieber (24) und der vierte Schieber (25) einander in einer Richtung gegenüberliegen, die senkrecht zu der Vorschubrichtung (7) ist, und auf Befehl zueinander hin oder voneinander fort beweglich sind.
5. Die Maschine gemäß Anspruch 4, **dadurch gekennzeichnet, dass** der erste Schieber (19) und/oder der zweite Schieber (23) auf der Seite, die in Eingriff mit dem zu montierenden Bund (3) stehen kann, einen ersten Zahn (39) haben, der zum gegenüberliegenden Schieber (23 oder 19) hin ragt und mit einer der zwei Schichten von Streifen (8a, 8b) in Eingriff stehen kann, die den zu montierenden Bund (3) bilden, und dadurch, dass der dritte Schieber (24) und/oder der vierte Schieber (25) auf der Seite, die mit dem zu montierenden Bund (3) in Eingriff stehen kann, einen zweiten Zahn (40) haben, der zum gegenüberliegenden Schieber (25 oder 24) hin herausragt und mit der anderen der zwei Schichten von Streifen (8a, 8b) in Eingriff stehen kann, die den zu montierenden Bund (3) bilden.
6. Die Maschine gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** die mindestens zwei Reihen (12a, 12b, 13a, 13b) von Nagelklemmen (14) zwei Paare von Reihen (12a, 12b, 13a, 13b) von Nagelklemmen (14) umfassen, nämlich ein erstes Paar von Reihen (12a, 12b) von Nagelklemmen (14), parallel zu der Vorschubrichtung (7) ausgerichtet, und ein zweites Paar von Reihen (13a, 13b) von Nagelklemmen (14), in rechten Winkeln zu der Vorschubrichtung (7) ausgerichtet.
7. Die Maschine gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Mittel (46) umfasst, um die individuelle Position der Nagelklemmen (14) parallel zu der Richtung zu variieren, in der sich die entsprechende Reihe (12a, 12b, 13a, 13b) von Nagelklemmen (14) erstreckt.
8. Die Maschine gemäß Anspruch 3, **dadurch gekennzeichnet, dass** sie eine Struktur (47) zum Tragen der Nagelklemmen (14) umfasst, die an der Nagelstation (4) oberhalb der Auflage- und Gleitfläche (18) angeordnet ist; wobei die tragende Struktur (47) der Nagelklemmen (14) vertikal mit Bezug auf die Auflage- und Gleitfläche (18) beweglich ist und von einer Betätigungsstruktur oder einem Hammer (48) überragt wird, mit der/dem sie gekoppelt ist; wobei die Betätigungsstruktur (48) auf Befehl mit einem Betätigungshub vertikal bewegt werden kann, abwärts, um die Anschläger (51) der Nagelklemmen (14) zu betätigen, und aufwärts, um die Nagelklemmen (14) nach oben von der Auflage- und Gleitfläche (18) zu beabstanden.
9. Die Maschine gemäß Anspruch 8, **dadurch gekennzeichnet, dass** die Betätigungsstruktur (48) verschiebbar von zwei Schultern (49, 50) einer Haupt-Tragestruktur (16) getragen wird, wobei Mittel bereitgestellt sind, um die Höhenposition (71) der Betätigungsstruktur (48) unabhängig von dem Betätigungshub einzustellen.
10. Die Maschine gemäß einem oder mehreren der Ansprüche 2 bis 9, **dadurch gekennzeichnet, dass** die Rotationsmittel (11) eine untere Welle (77) umfassen, die eine vertikale Achse hat und an ihrem oberen Ende mit einer unteren Klaue (78) ausgestattet ist, und eine obere Welle (79), die koaxial mit der unteren Welle (77) angeordnet und an ihrem unteren Ende mit einer oberen Klaue (80) ausgestattet ist; wobei die untere Welle (77) und die obere Welle (79) so angeordnet sind, dass sich ihre Achse an der Hauptachse (15) befindet; wobei die untere Welle (77) und die obere Welle (79) entlang der entsprechenden Achse beweglich sind, um die untere Fläche beziehungsweise die obere Fläche des zu montierenden Bundes (3) zu halten, der sich in der Nagelstation (4) befindet, oder um sich von dem zu montierenden Bund (3) zu lösen; wobei die untere Welle (77) und die obere Welle (79) um die gemeinsame Achse drehbar sind, um den zu montierenden Bund (3) um seine eigene Achse zu drehen.
11. Die Maschine gemäß Anspruch 10, **dadurch gekennzeichnet, dass** die untere Welle (77) sich frei um ihre eigene Achse drehen kann.
12. Die Maschine gemäß Anspruch 10 oder 11, **dadurch gekennzeichnet, dass** die obere Welle (79) mit einem entsprechenden Getriebemotor (84) verbunden ist, der angetrieben werden kann, um die Drehung der oberen Welle (79) um ihre eigene Achse anzutreiben.
13. Die Maschine gemäß einem oder mehreren der obigen Ansprüche, **dadurch gekennzeichnet, dass** sie Nietmaschinen (41, 42, 43, 44) umfasst, die in der Nagelstation (4) unterhalb der Nagelklemmen (14) angeordnet sind.
14. Die Maschine gemäß Anspruch 13, **dadurch gekennzeichnet, dass** die Nietmaschinen (41, 42, 43, 44) in vier Nietmaschinen (41, 42, 43, 44) bestehen,

die kreuzförmig radial mit Bezug auf die Hauptachse (15) angeordnet sind.

15. Die Maschine gemäß Anspruch 13 oder 14, **dadurch gekennzeichnet, dass** jede der Nietmaschinen (41, 42, 43, 44) sich auf Befehl vertikal und parallel zu der Richtung bewegen kann, in der die Reihe oder das Paar von Reihen (12a, 12b, 13a, 13b) von Nagelklemmen (14), unter der/dem sie angeordnet ist, sich erstreckt.

Revendications

1. Machine à clouer, en particulier pour assembler des brides de bobines en bois servant à enrouler des câbles électriques, câbles en acier, cordes, câbles de fibre optique ou éléments de type fil métallique en général, comprenant :

- une station (2) pour composer une bride d'une bobine à assembler (3) ;
- une station de clouage (4) ;
- un moyen (5) pour supporter la bride à assembler (3) sur un plan substantiellement horizontal ;
- un moyen (6) pour l'avance de la bride à assembler (3) de ladite station de composition (2) à ladite station de clouage (4) le long d'une direction d'avance (7), ladite bride à assembler (3) étant composée de deux couches de bandes (8a, 8b) dans lesquelles les bandes (8a) d'une couche sont orientées à angle droit par rapport à ladite direction d'avance (7) et les bandes (8b) de l'autre couche sont orientées parallèlement à ladite direction d'avance (7) ;
- un moyen (9) pour compacter les bandes (8a, 8b) desdites deux couches respectivement le long d'une direction qui est parallèle à ladite direction d'avance (7) et le long d'une direction qui est perpendiculaire à ladite direction d'avance (7) ;
- un moyen de clouage (10) placé au niveau de ladite station de clouage (4) ;
- un moyen (11) pour faire tourner ladite bride à assembler (3) autour de son propre axe, qui est orienté substantiellement verticalement, ledit moyen étant placé au niveau de ladite station de clouage (4) ;

caractérisée en ce que ledit moyen de clouage (10) comprend au moins deux rangées (12a, 12b, 13a, 13b) de pinces à clouer (14), qui sont orientées à angle droit l'une par rapport à l'autre, respectivement au moins une première rangée (12a, 12b) de pinces à clouer (14) qui est orientée parallèlement à ladite direction d'avance (7) et au moins une deuxième rangée (13a, 13b) de pinces à clouer (14) qui est orien-

tée à angle droit par rapport à ladite direction d'avance (7).

2. Machine selon la revendication 1, **caractérisée en ce que** lesdites au moins deux rangées (12a, 12b, 13a, 13b) de pinces à clouer (14) sont placées le long d'une croix qui est centrée sur un axe principal vertical (15) sur lequel l'axe de la bride à assembler (3) dans ladite station de clouage (4) est positionné.
3. Machine selon la revendication 1, **caractérisée en ce que** ledit moyen de support (5) comprend des barres (17) qui définissent une surface d'appui et de glissement sensiblement horizontale (18) pour la bride à assembler (3) et qui s'étendent de ladite station de composition (2) à ladite station de clouage (4) ; ledit moyen d'avance (6) comprenant un premier poussoir (19) adapté pour faire saillie vers le haut depuis ladite surface d'appui et de glissement (18) ; ledit premier poussoir (19) pouvant se mettre en prise avec la bride à assembler (3) et étant mobile sur demande le long de ladite direction d'avance (7) afin de pousser ladite bride à assembler (3) de ladite station de composition (2) à ladite station de clouage (4).
4. Machine selon l'une ou plusieurs des revendications précédentes, **caractérisée en ce que** ledit moyen de compactage (9) comprend :

- ledit premier poussoir (19) ;
- un deuxième poussoir (23) qui est placé au niveau de ladite station de clouage (4) et qui peut se déplacer depuis une position inactive, dans laquelle il est placé sous ladite surface d'appui et de glissement (18) afin de ne pas interférer avec ladite bride à assembler (3), vers une position active, dans laquelle il fait saillie vers le haut depuis ladite surface d'appui et de glissement (18) du côté opposé par rapport audit premier poussoir (19) afin de se mettre en prise sur le côté de ladite bride à assembler (3) qui est opposé par rapport au côté avec lequel se met en prise ledit premier poussoir (19) ;
- un troisième poussoir (24) qui est placé au niveau de ladite station de clouage (4) et qui est adapté pour faire saillie vers le haut depuis ladite surface d'appui et de glissement (18) ;
- un quatrième poussoir (25) qui est placé au niveau de ladite station de clouage (4) et qui est adapté pour faire saillie vers le haut depuis ladite surface d'appui et de glissement (18) ;
- ledit troisième poussoir (24) et ledit quatrième poussoir (25) étant mutuellement opposés le long d'une direction qui est perpendiculaire à ladite direction d'avance (7) et étant mobiles sur demande pour se rapprocher ou s'éloigner l'un de l'autre.

5. Machine selon la revendication 4, **caractérisée en ce qu'**au moins un poussoir parmi ledit premier poussoir (19) et ledit deuxième poussoir (23) comporte, sur son côté qui peut se mettre en prise avec la bride à assembler (3), une première dent (39) qui fait saillie vers le poussoir opposé (23 ou 19) et qui peut se mettre en prise avec l'une des deux couches de bandes (8a, 8b) qui composent la bride à assembler (3), et **en ce qu'**au moins un poussoir parmi ledit troisième poussoir (24) et ledit quatrième poussoir (25) comporte, sur son côté qui peut se mettre en prise avec la bride à assembler (3), une deuxième dent (40) qui fait saillie vers le poussoir opposé (25 ou 24) et qui peut se mettre en prise avec l'autre desdites deux couches de bandes (8a, 8b) qui composent la bride à assembler (3).
6. Machine selon l'une ou plusieurs des revendications précédentes, **caractérisée en ce que** lesdites au moins deux rangées (12a, 12b, 13a, 13b) de pinces à clouer (14) comprennent deux paires de rangées (12a, 12b, 13a, 13b) de pinces à clouer (14), respectivement : une première paire de rangées (12a, 12b) de pinces à clouer (14) orientées parallèlement à ladite direction d'avance (7) et une deuxième paire de rangées (13a, 13b) de pinces à clouer (14) orientées à angle droit par rapport à ladite direction d'avance (7).
7. Machine selon l'une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend un moyen (46) pour faire varier la position individuelle desdites pinces à clouer (14) parallèlement à la direction le long de laquelle s'étend la rangée correspondante (12a, 12b, 13a, 13b) de pinces à clouer (14).
8. Machine selon la revendication 3, **caractérisée en ce qu'**elle comprend une structure (47) destinée à supporter lesdites pinces à clouer (14) qui est placée au niveau de ladite station de clouage (4) au-dessus de ladite surface d'appui et de glissement (18) ; ladite structure de support (47) des pinces à clouer (14) étant mobile verticalement par rapport à ladite surface d'appui et de glissement (18) et étant surmontée d'une structure d'actionnement ou marteau (48) à laquelle elle est accouplée ; ladite structure d'actionnement (48) étant mobile sur demande verticalement, avec une course d'actionnement, vers le bas pour actionner les percuteurs (51) desdites pinces à clouer (14) et vers le haut pour éloigner lesdites pinces à clouer (14) au-dessus de ladite surface d'appui et de glissement (18).
9. Machine selon la revendication 8, **caractérisée en ce que** ladite structure d'actionnement (48) est supportée de façon glissante par deux épaulements (49, 50) d'une structure de support principale (16), un moyen étant prévu pour régler la position en hauteur (71) de ladite structure d'actionnement (48) indépendamment de ladite course d'actionnement.
10. Machine selon l'une ou plusieurs des revendications 2 à 9, **caractérisée en ce que** ledit moyen de rotation (11) comprend un arbre inférieur (77), qui a un axe vertical et est pourvu, à son extrémité supérieure, d'une griffe inférieure (78) et d'un arbre supérieur (79), qui est disposé de façon coaxiale avec ledit arbre inférieur (77) et qui est pourvu, à son extrémité inférieure, d'une griffe supérieure (80) ; ledit arbre inférieur (77) et ledit arbre supérieur (79) étant placés de telle manière que leur axe est au niveau dudit axe principal (15) ; ledit arbre inférieur (77) et ledit arbre supérieur (79) étant mobiles le long de l'axe correspondant afin de se mettre en prise respectivement avec la face inférieure et la face supérieure de la bride à assembler (3) placée dans ladite station de clouage (4) ou de se dégager de la bride à assembler (3) ; ledit arbre inférieur (77) et ledit arbre supérieur (79) pouvant tourner autour de l'axe commun afin de faire tourner la bride à assembler (3) autour de son propre axe.
11. Machine selon la revendication 10, **caractérisée en ce que** ledit arbre inférieur (77) peut tourner librement autour de son propre axe.
12. Machine selon la revendication 10 ou 11, **caractérisée en ce que** ledit arbre supérieur (79) est connecté à un motoréducteur correspondant (84) qui peut être actionné afin de déclencher la rotation dudit arbre supérieur (79) autour de son propre axe.
13. Machine selon l'une ou plusieurs des revendications précédentes, **caractérisée en ce qu'**elle comprend des riveteuses (41, 42, 43, 44) placées dans ladite station de clouage (4) sous lesdites pinces à clouer (14).
14. Machine selon la revendication 13, **caractérisée en ce que** lesdites riveteuses (41, 42, 43, 44) sont constituées par quatre riveteuses (41, 42, 43, 44) disposées en croix de façon radiale par rapport audit axe principal (15).
15. Machine selon la revendication 13 ou 14, **caractérisée en ce que** chacune desdites riveteuses (41, 42, 43, 44) peut se déplacer sur demande verticalement et parallèlement à la direction le long de laquelle s'étend la rangée ou la paire de rangées (12a, 12b, 13a, 13b) de pinces à clouer (14) sous laquelle elle se trouve.

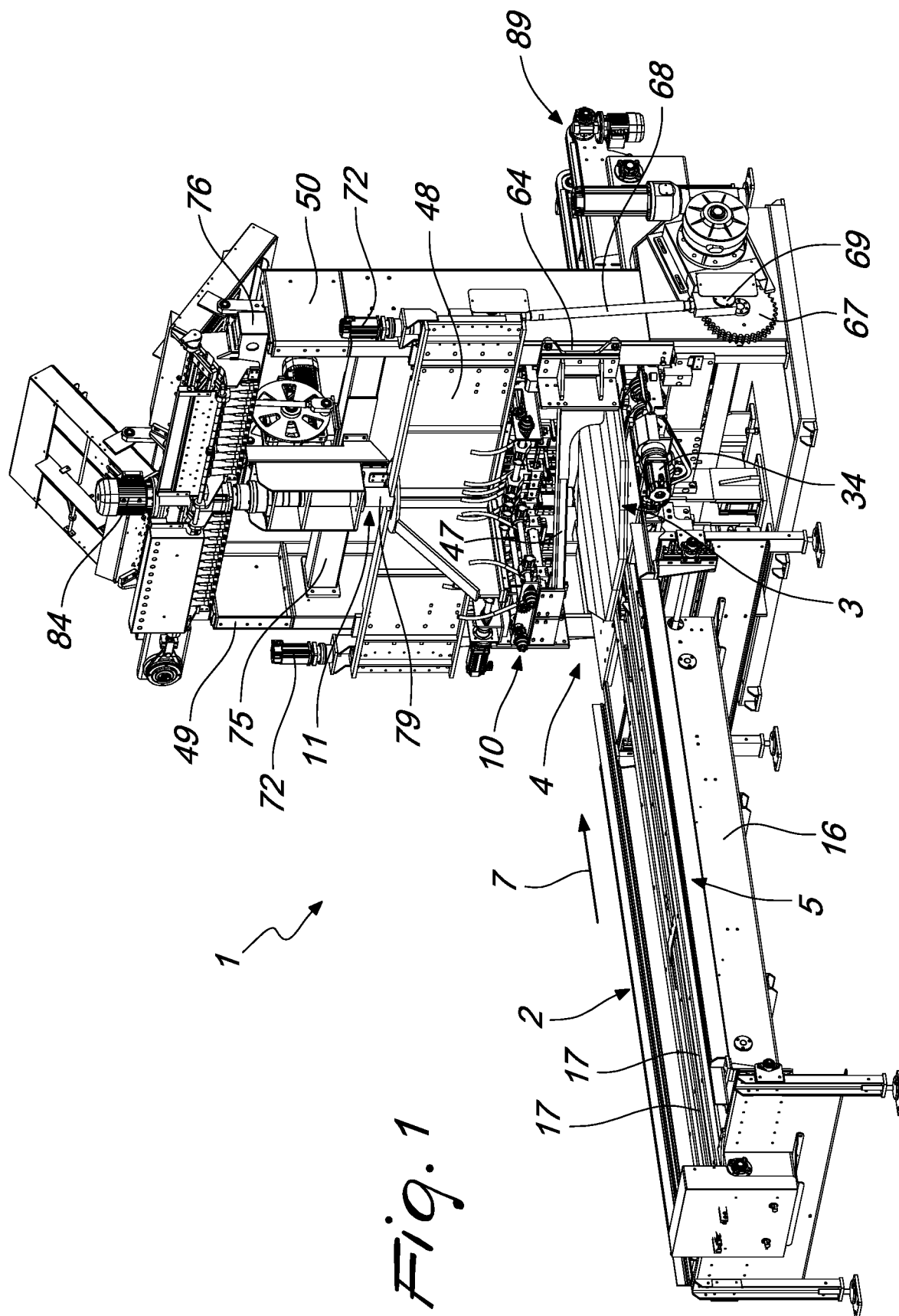


Fig. 1

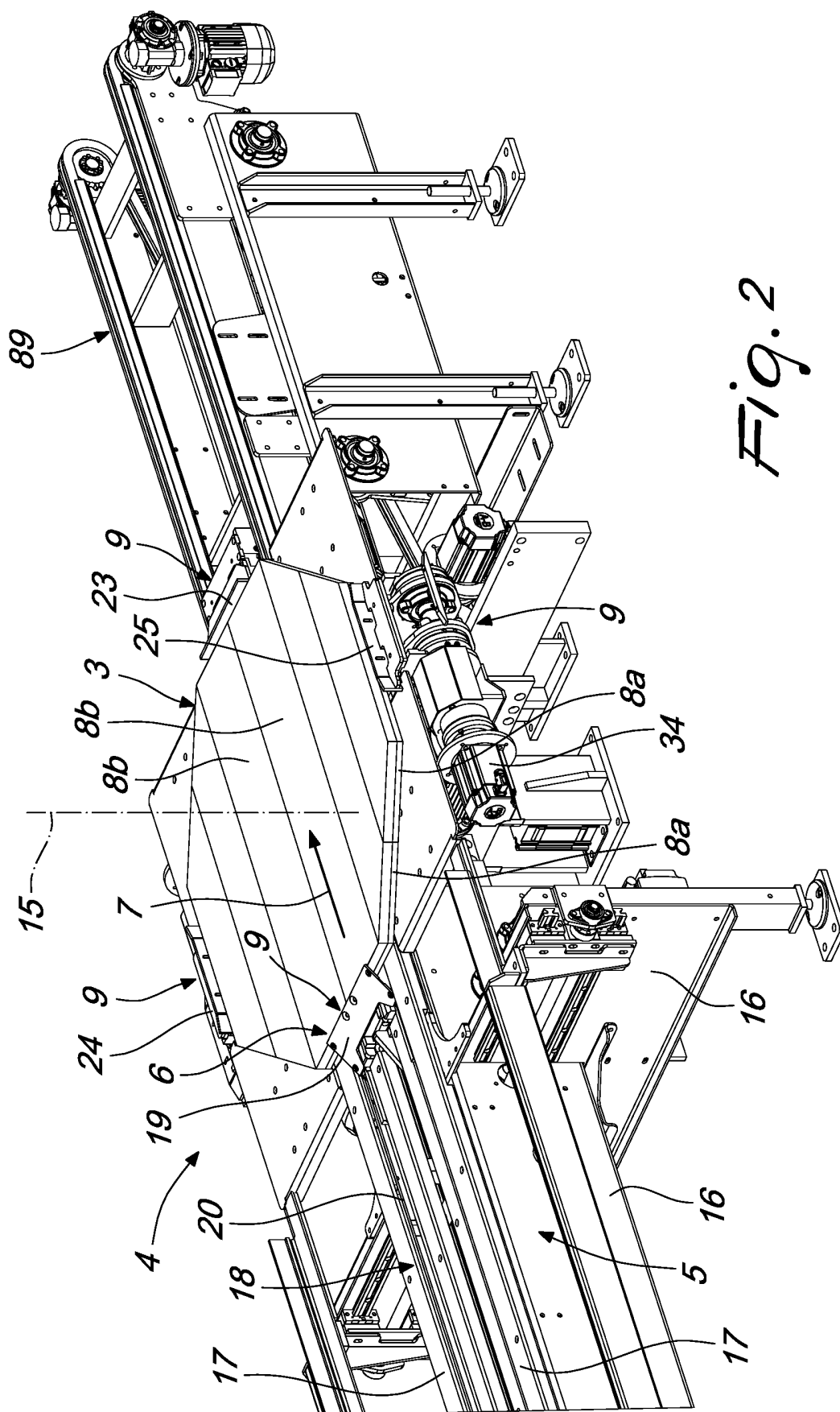
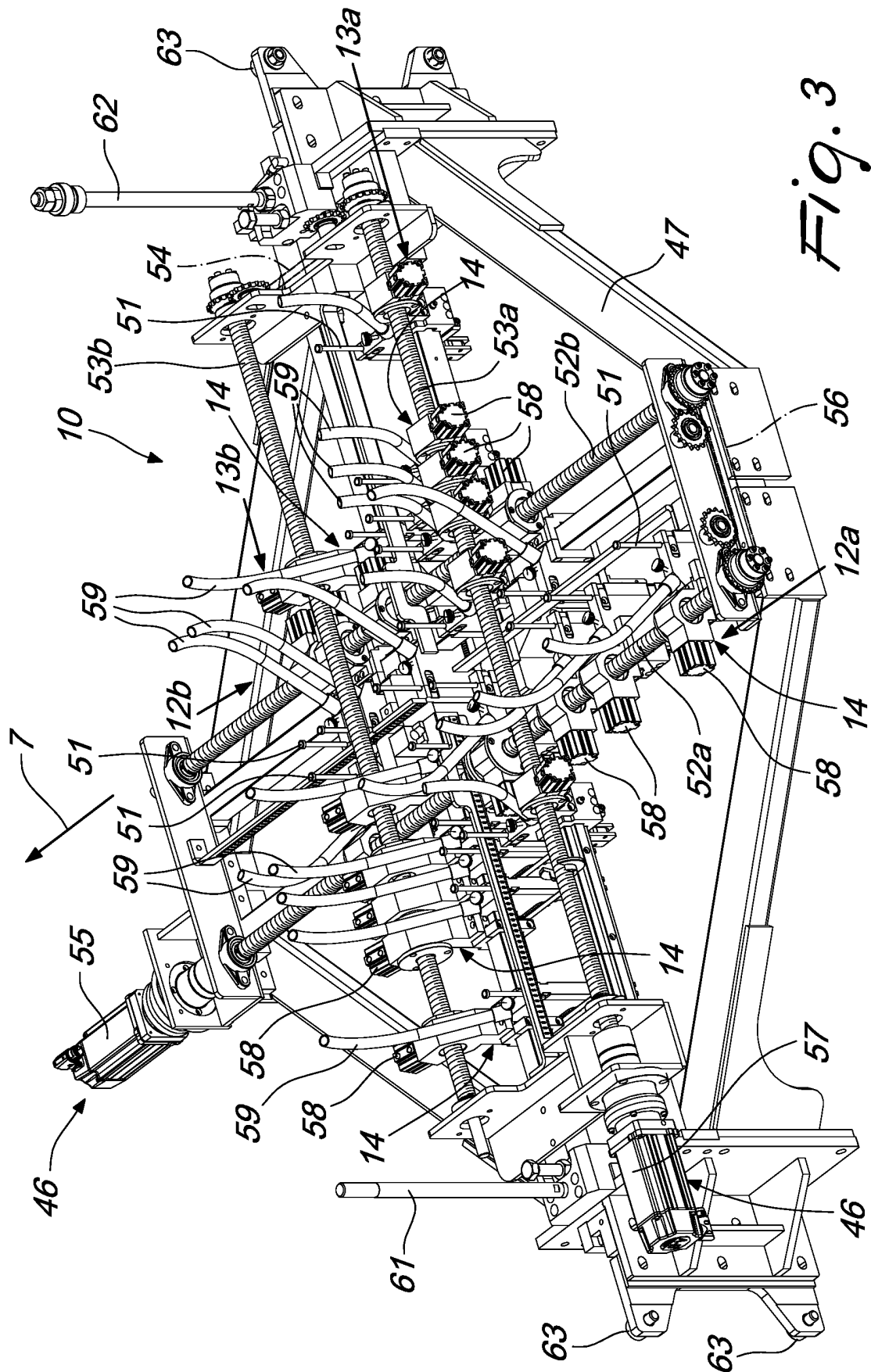


Fig. 2



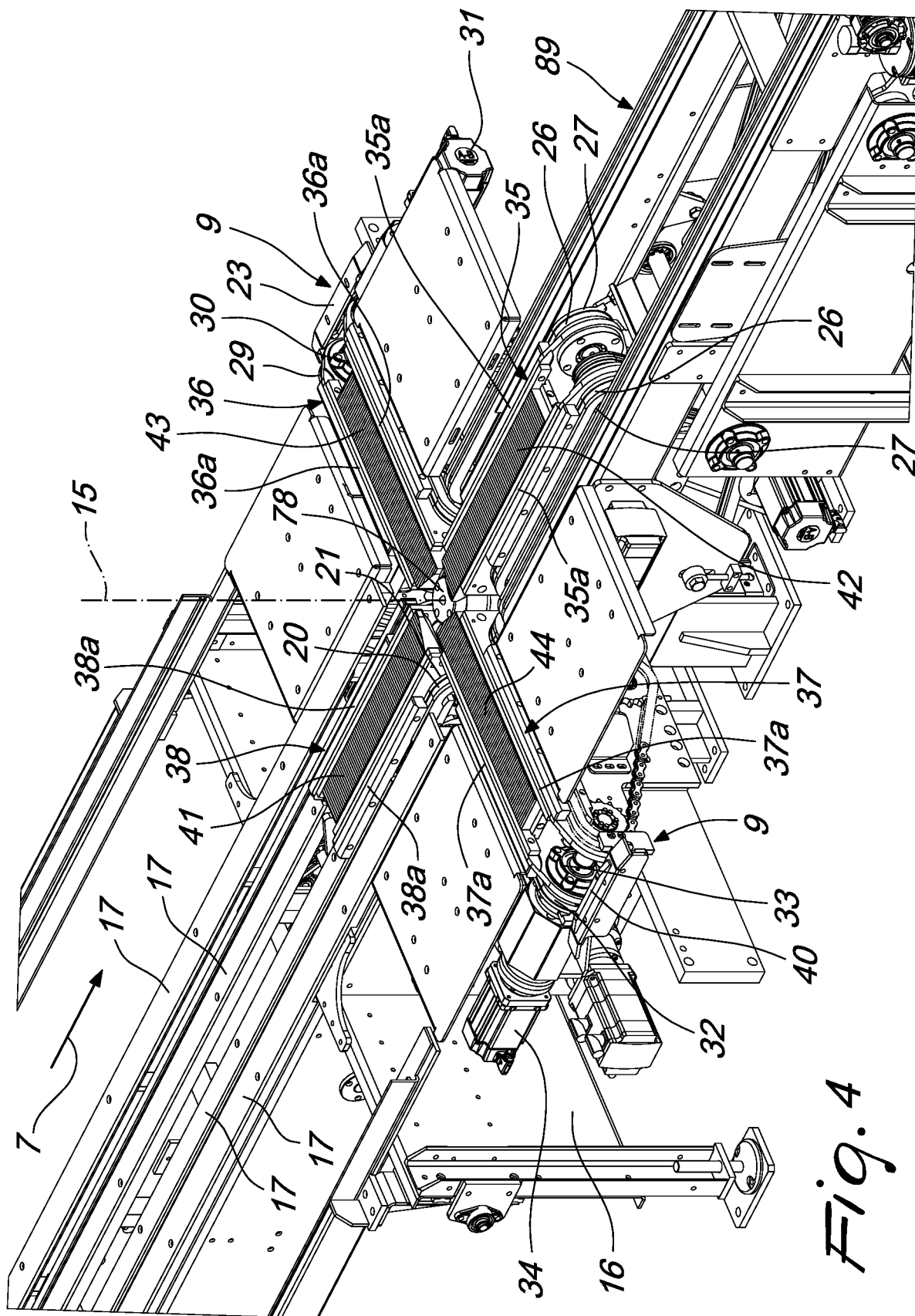
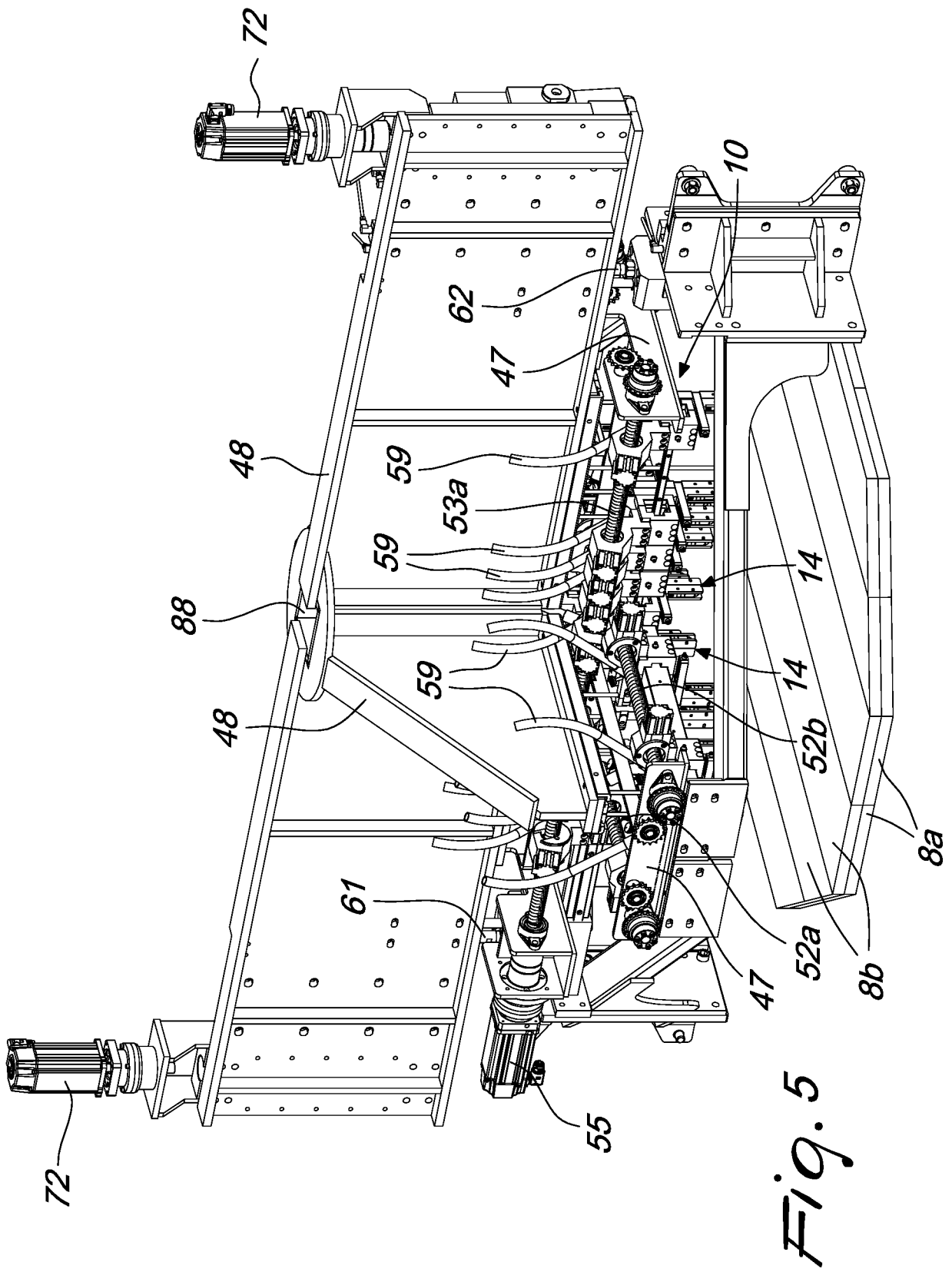


Fig. 4



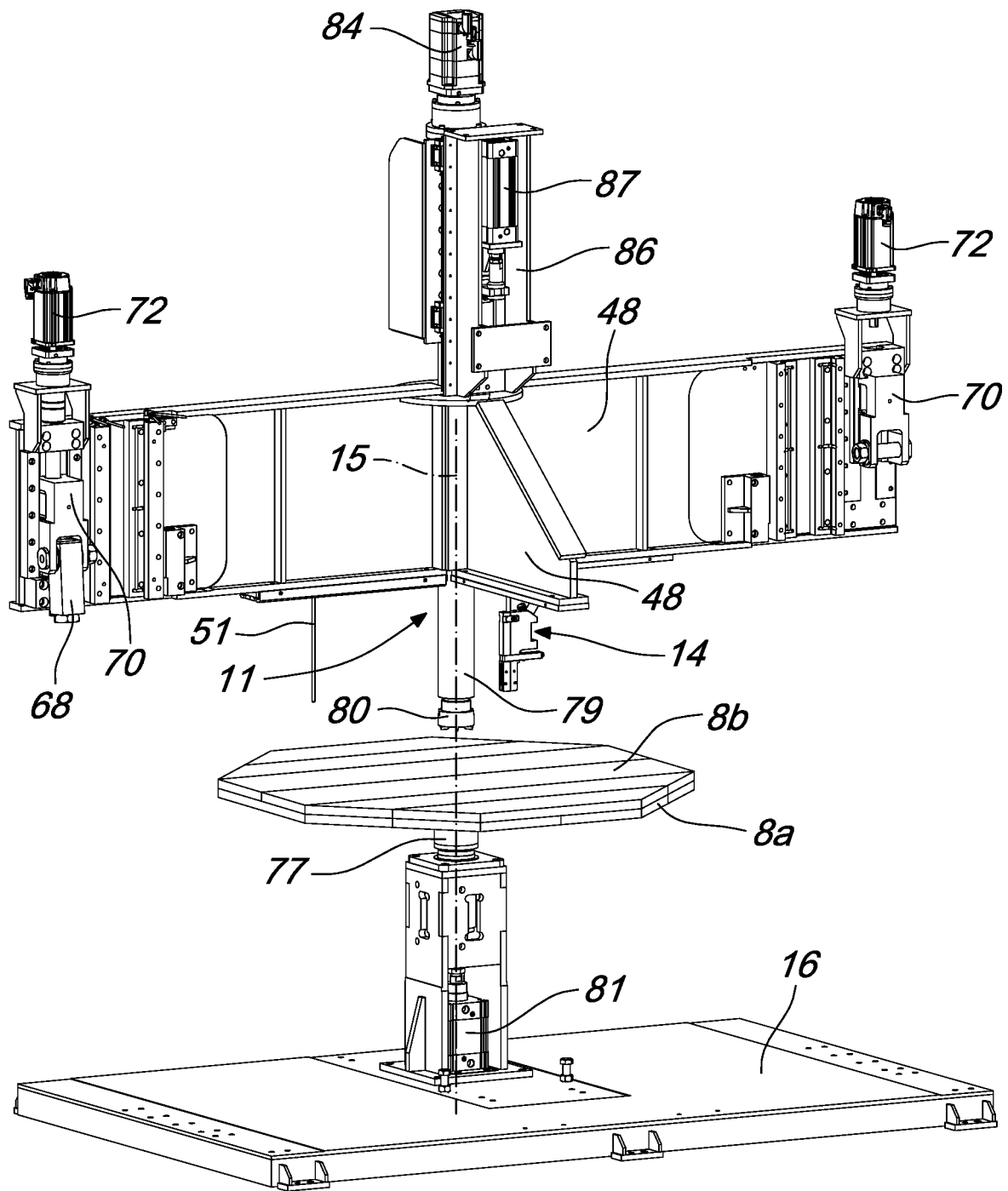
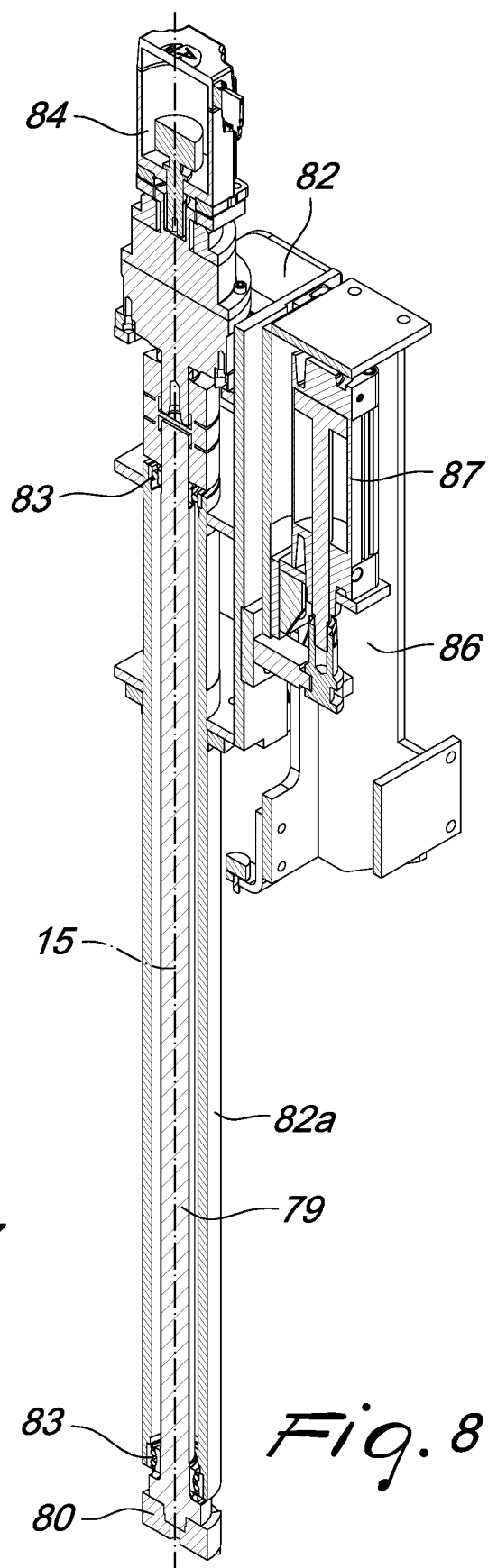
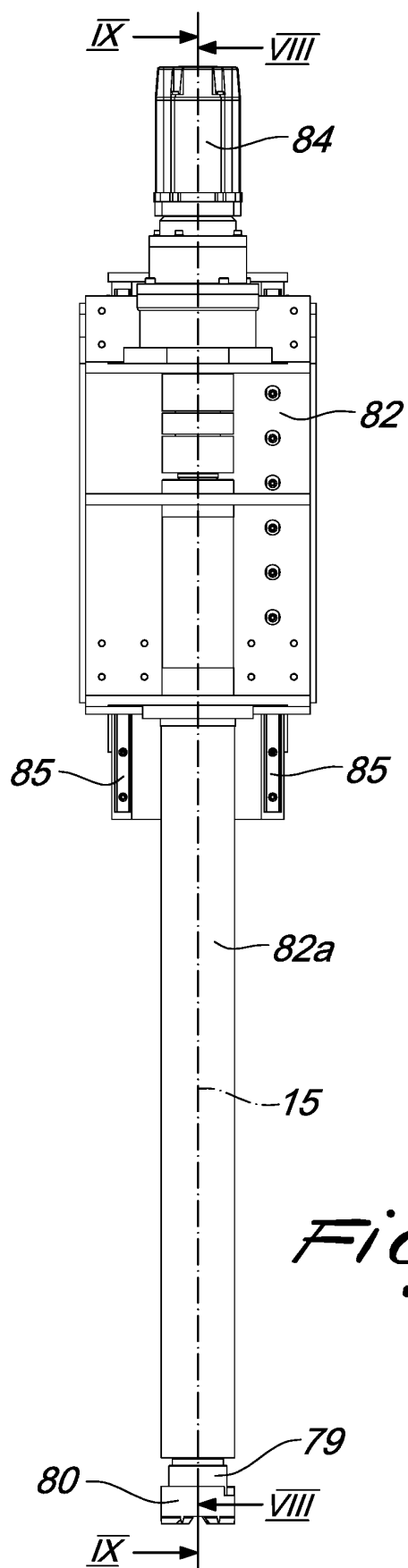


Fig. 6



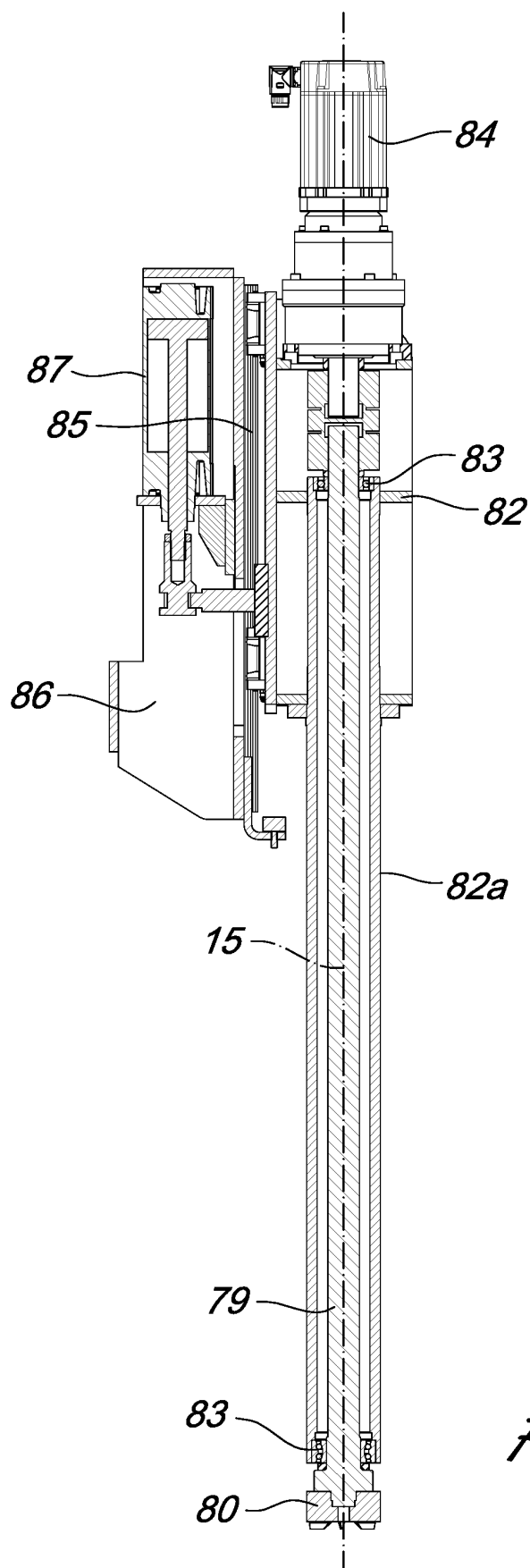


Fig. 9

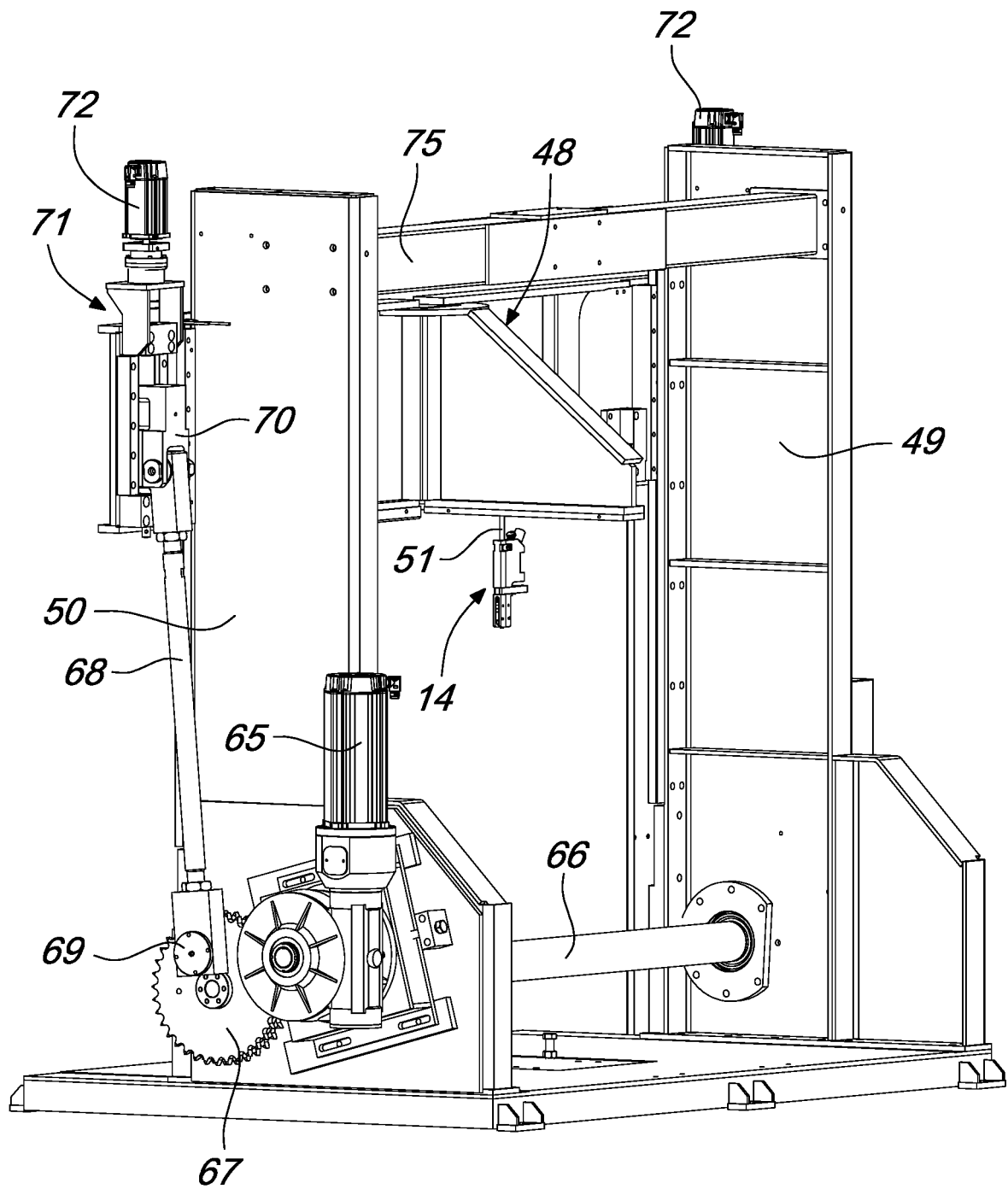
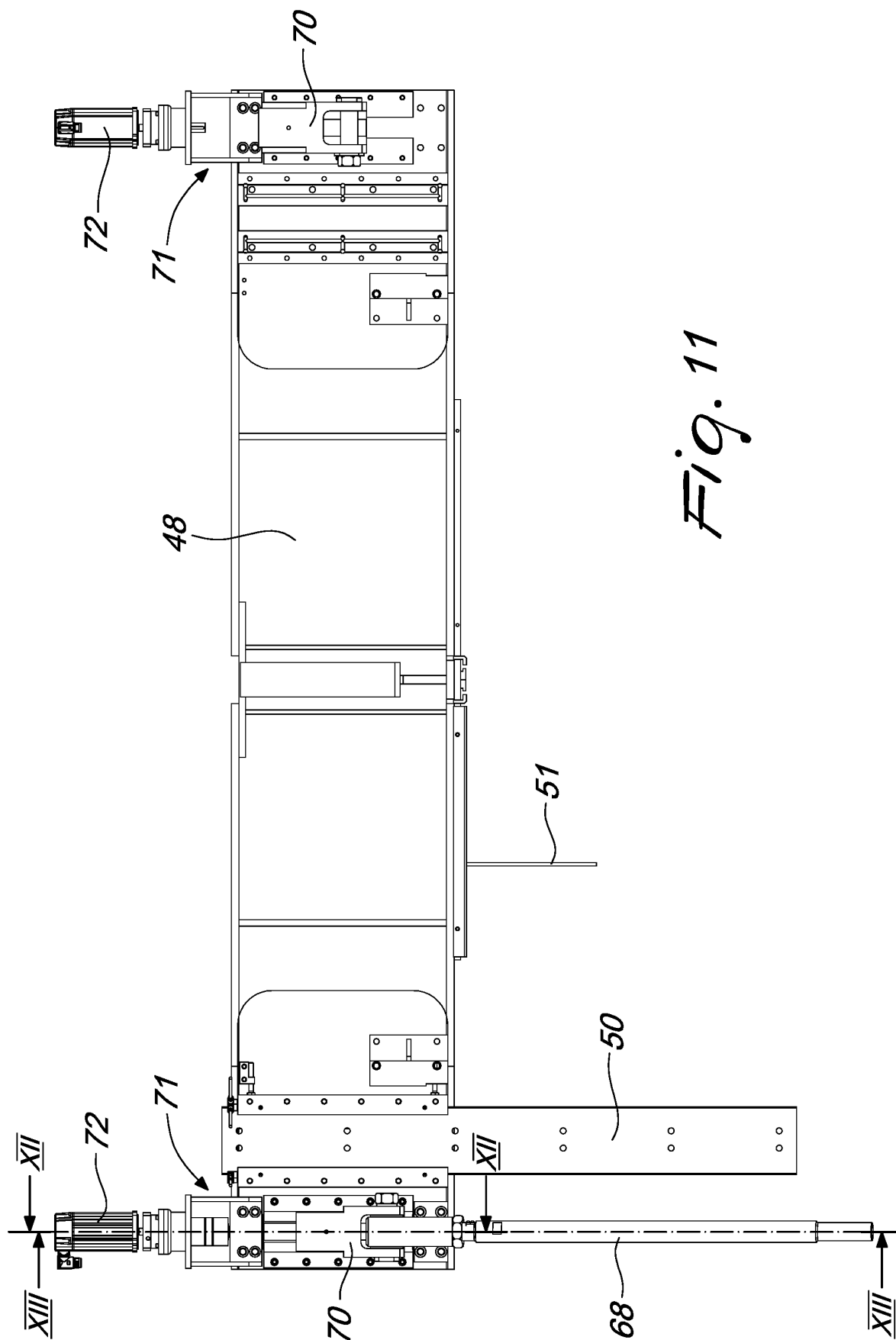


Fig. 10



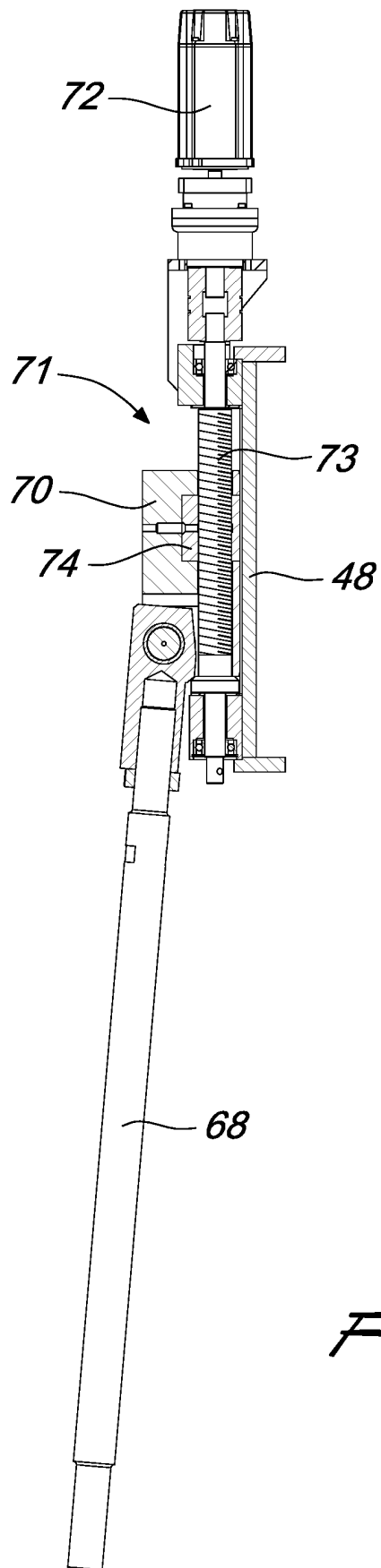


Fig. 12

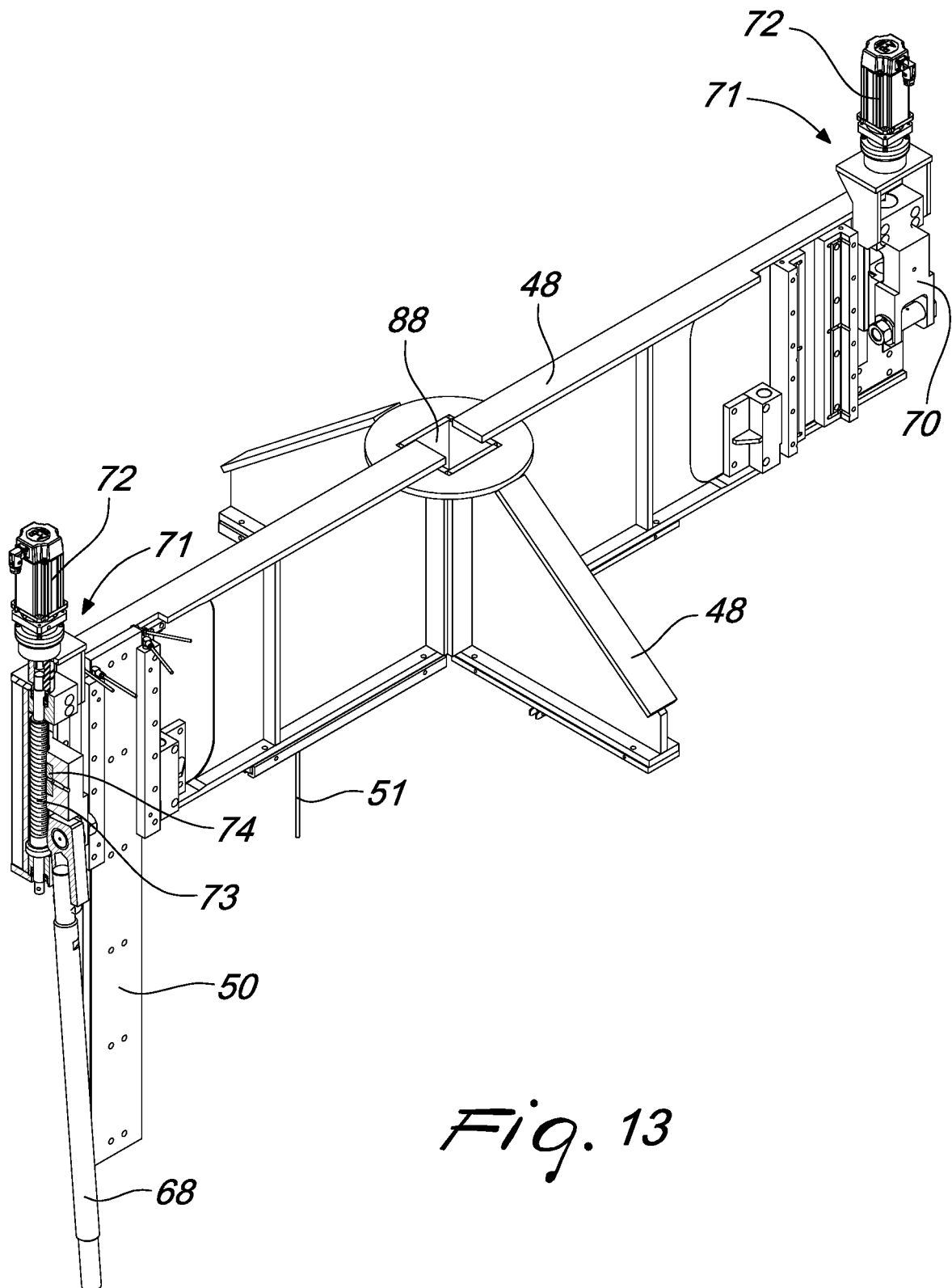


Fig. 13

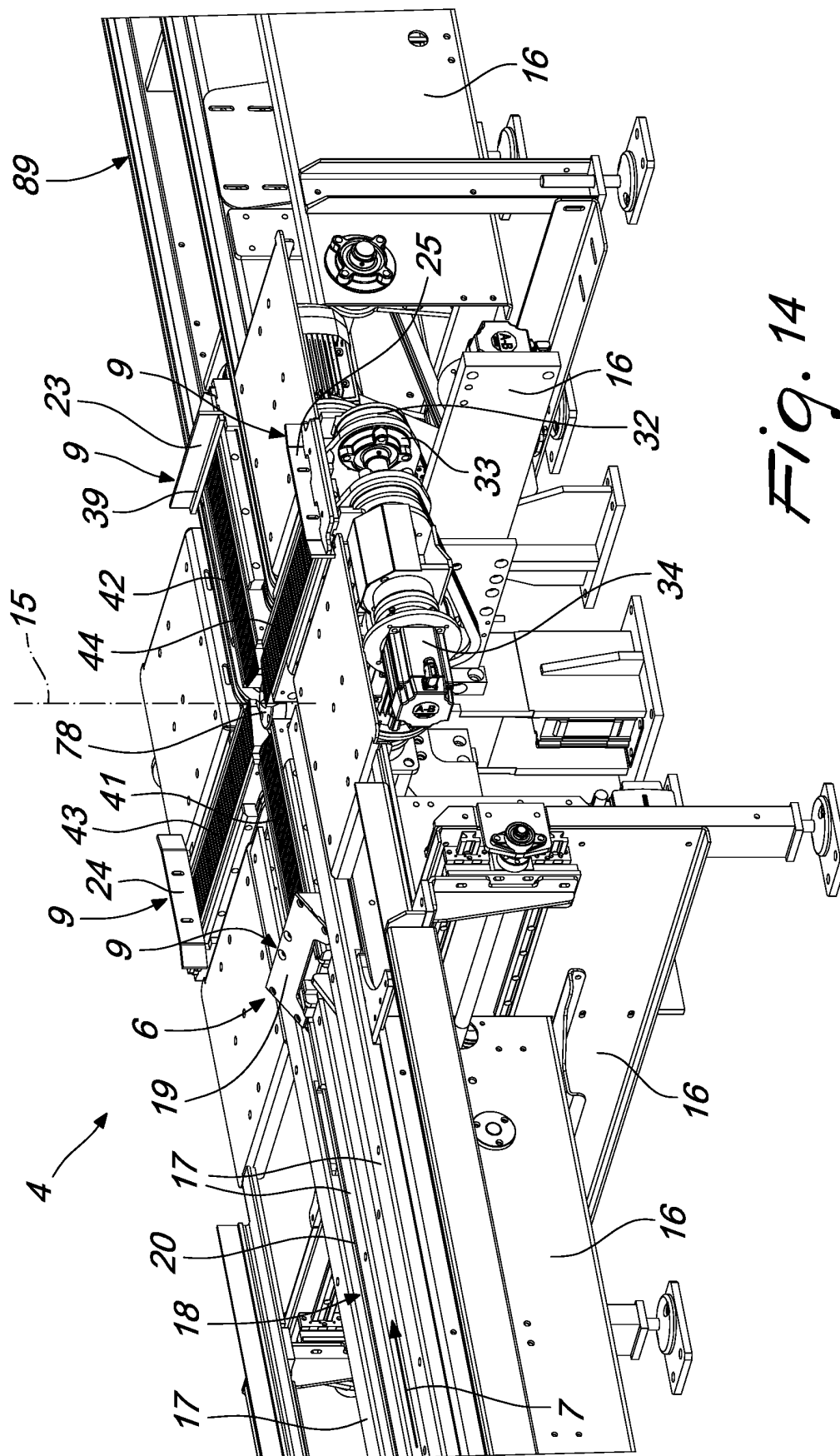


Fig. 14

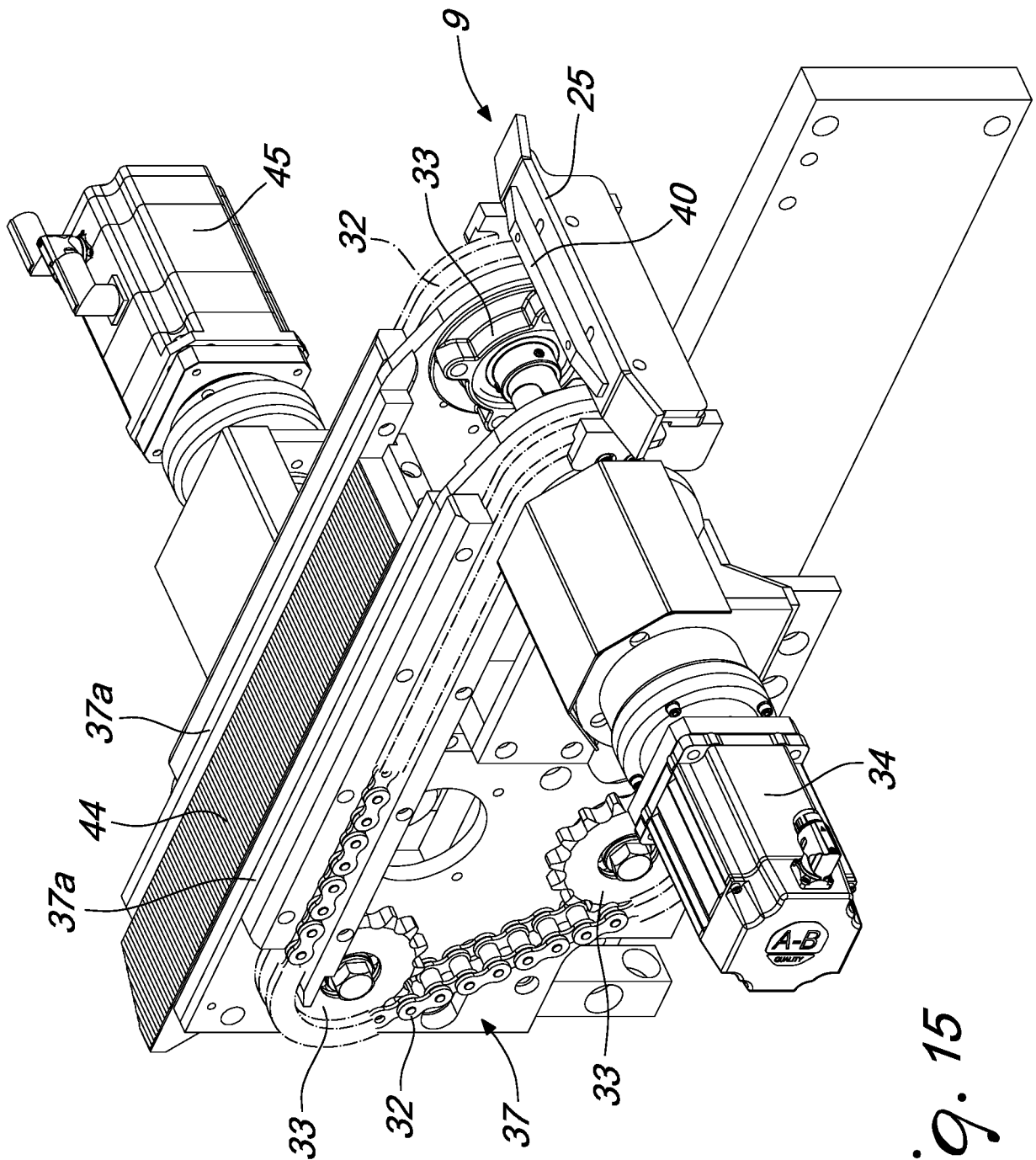


Fig. 15

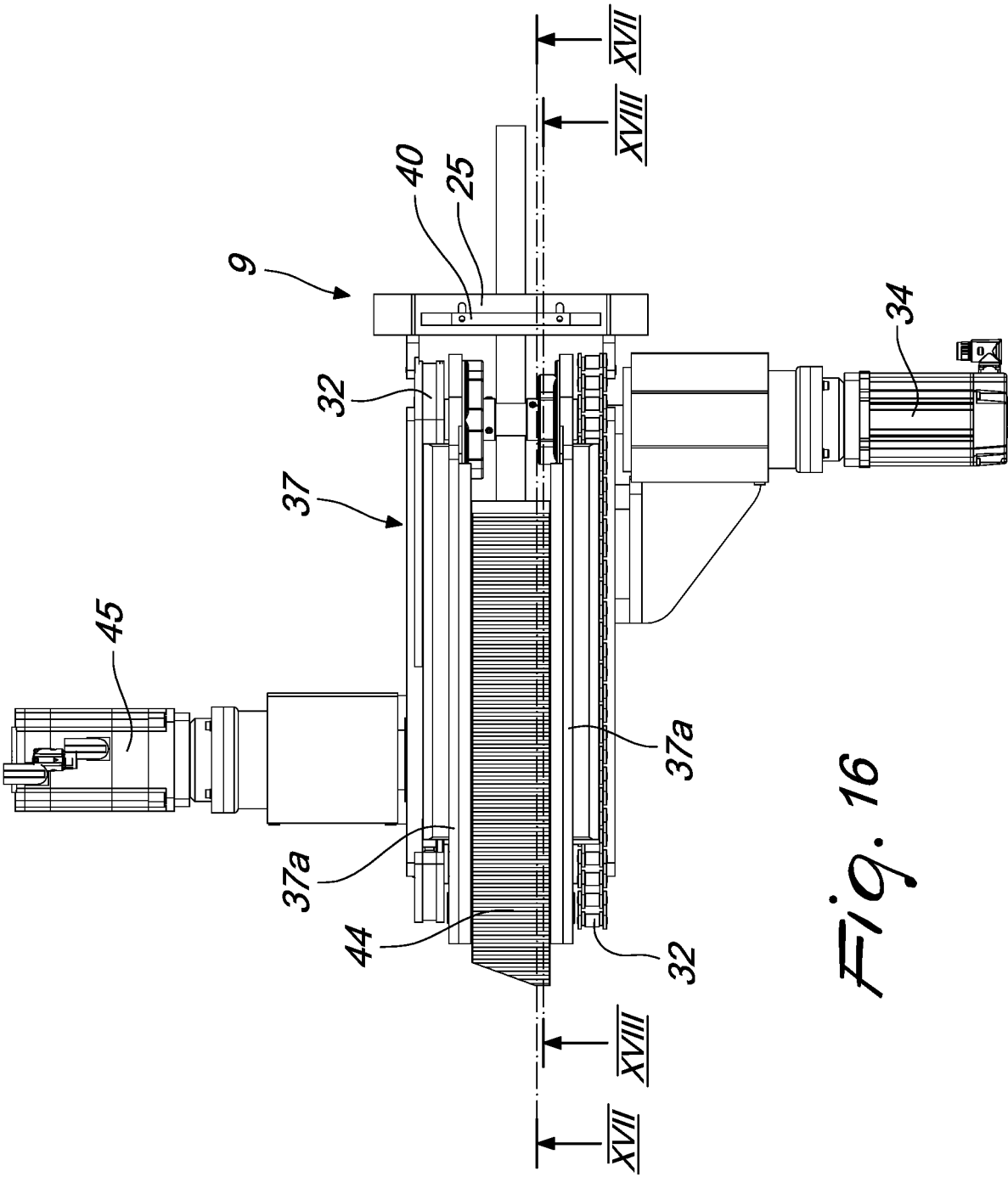


Fig. 16

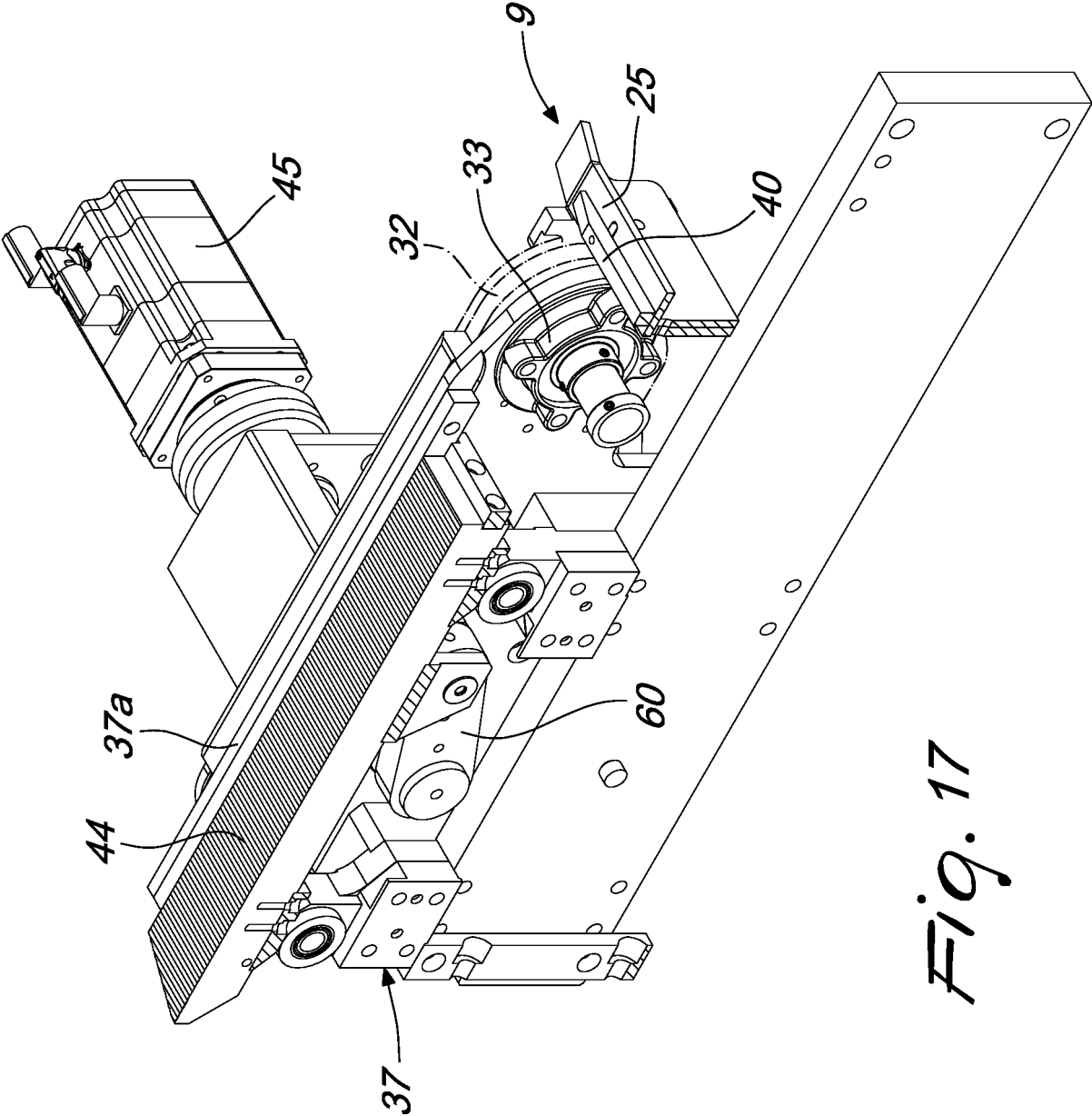


Fig. 17

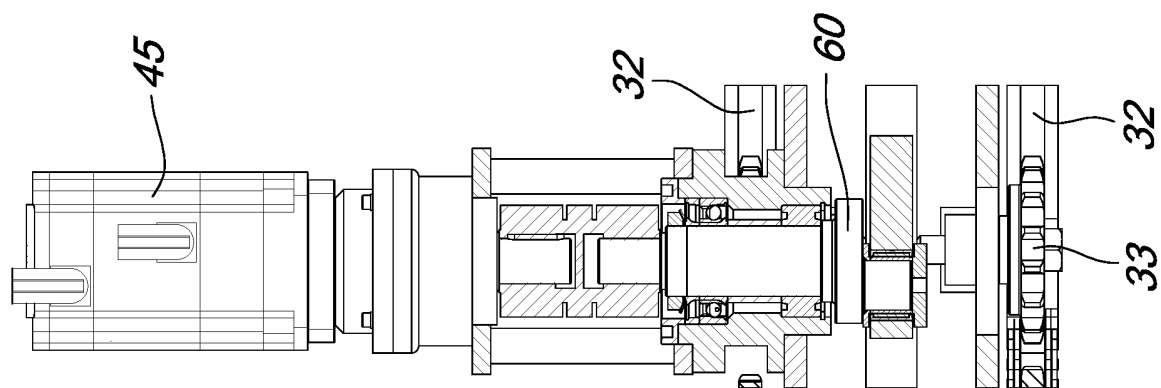


Fig. 19

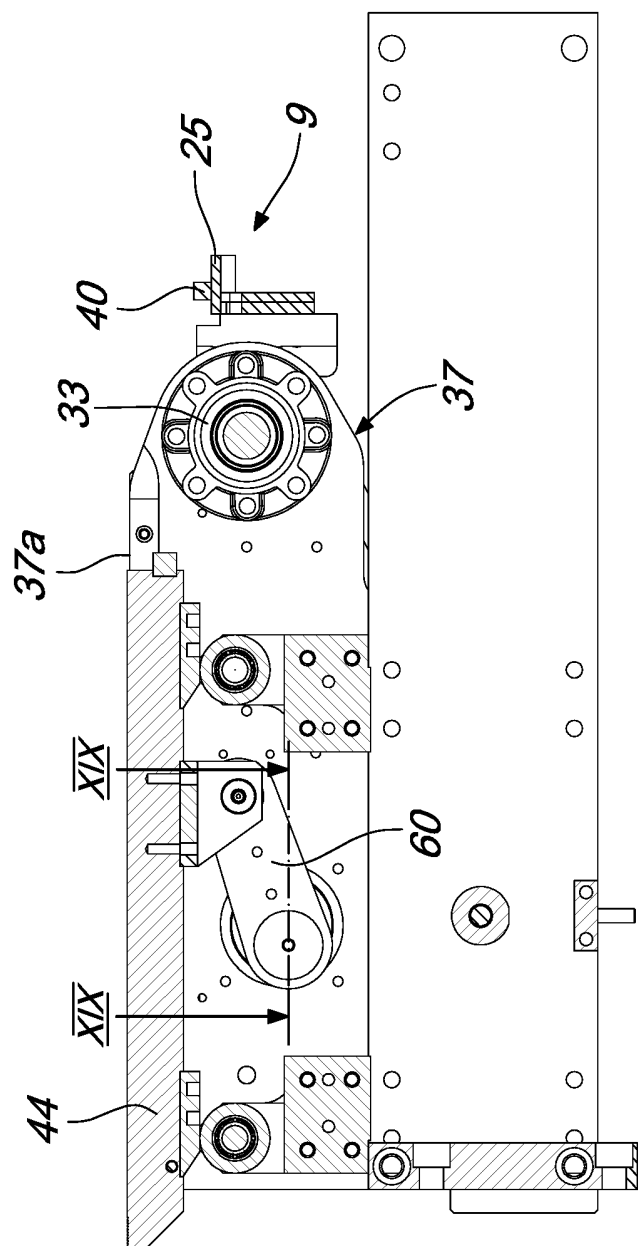


Fig. 18

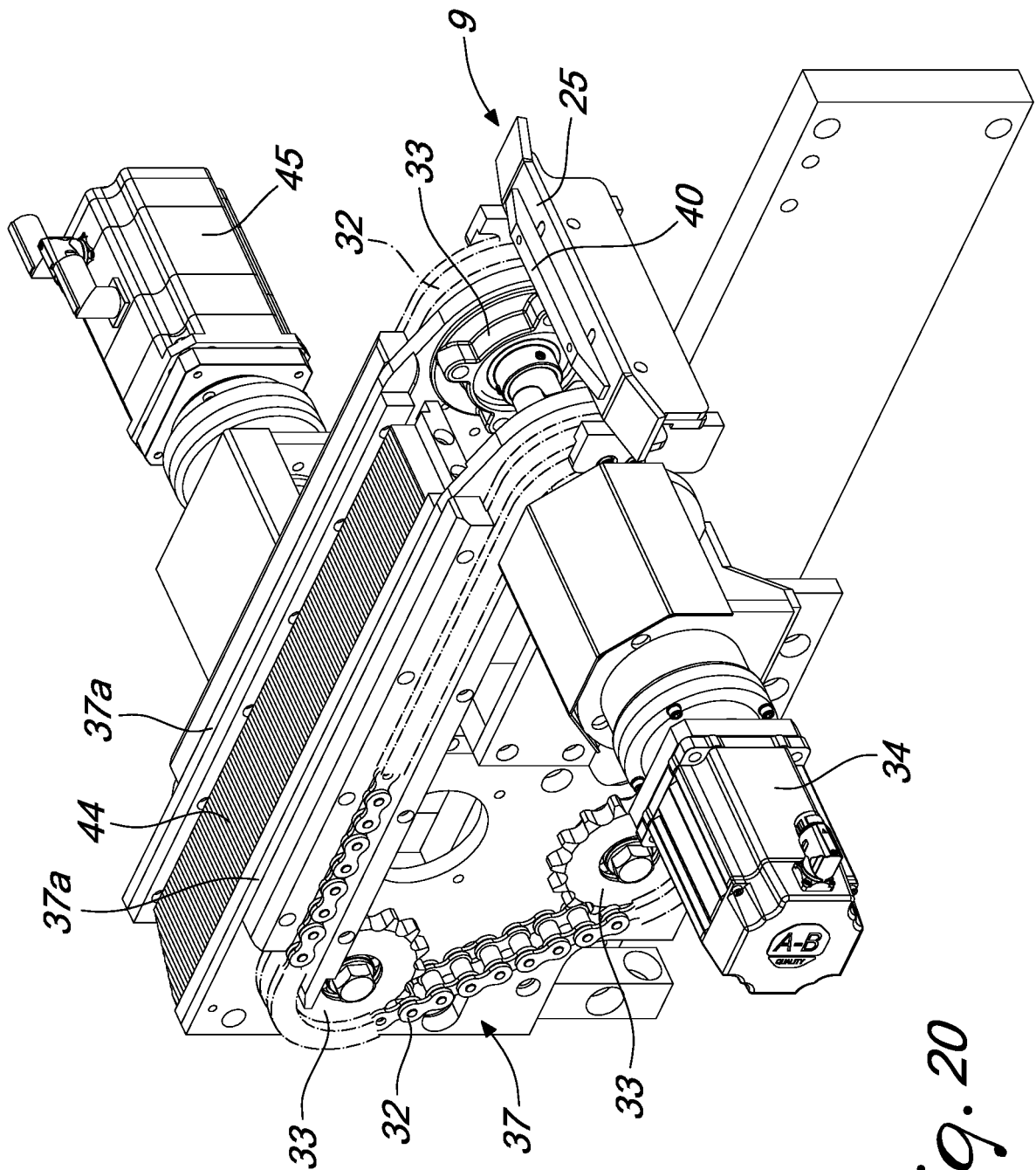


Fig. 20

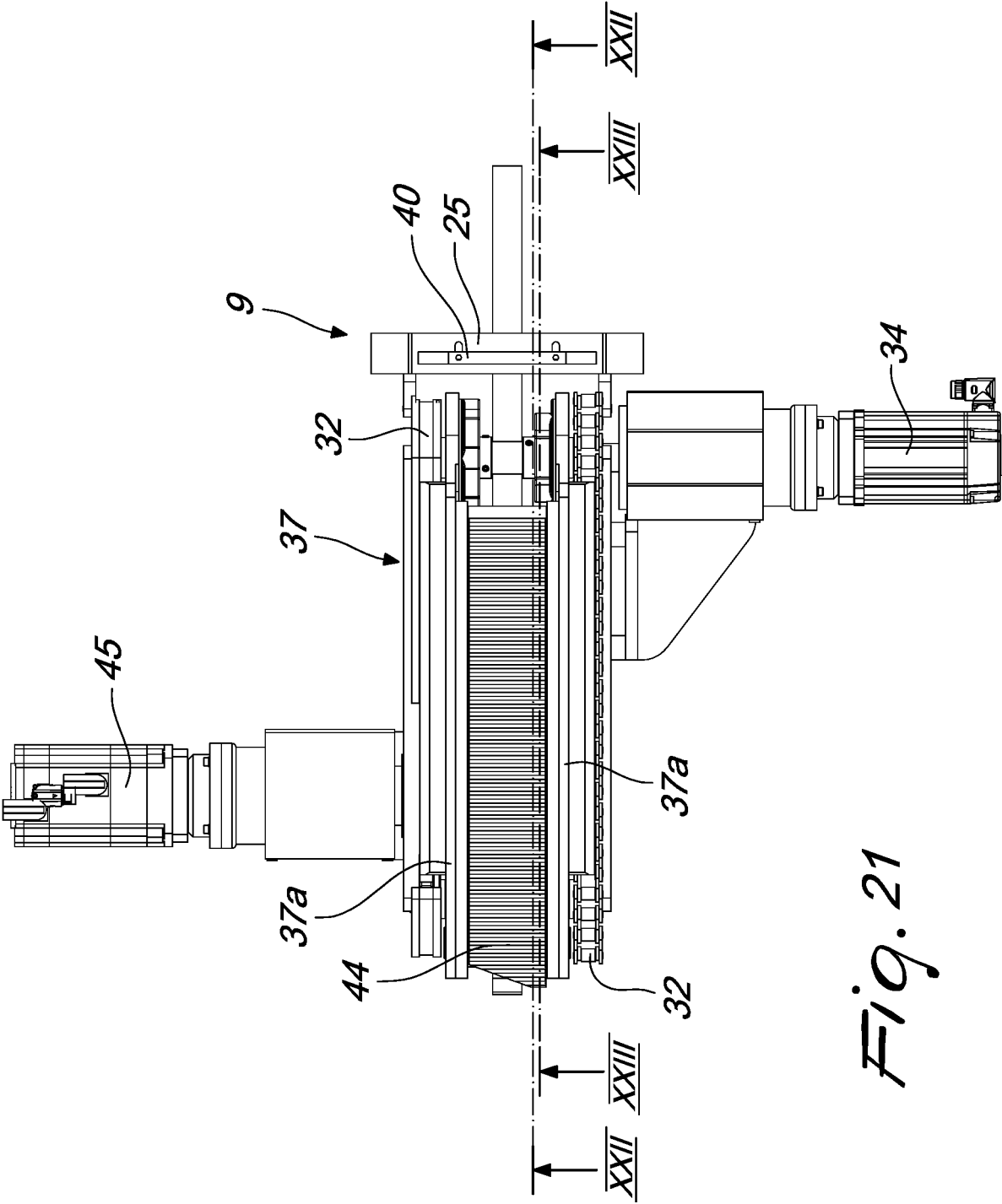


Fig. 21

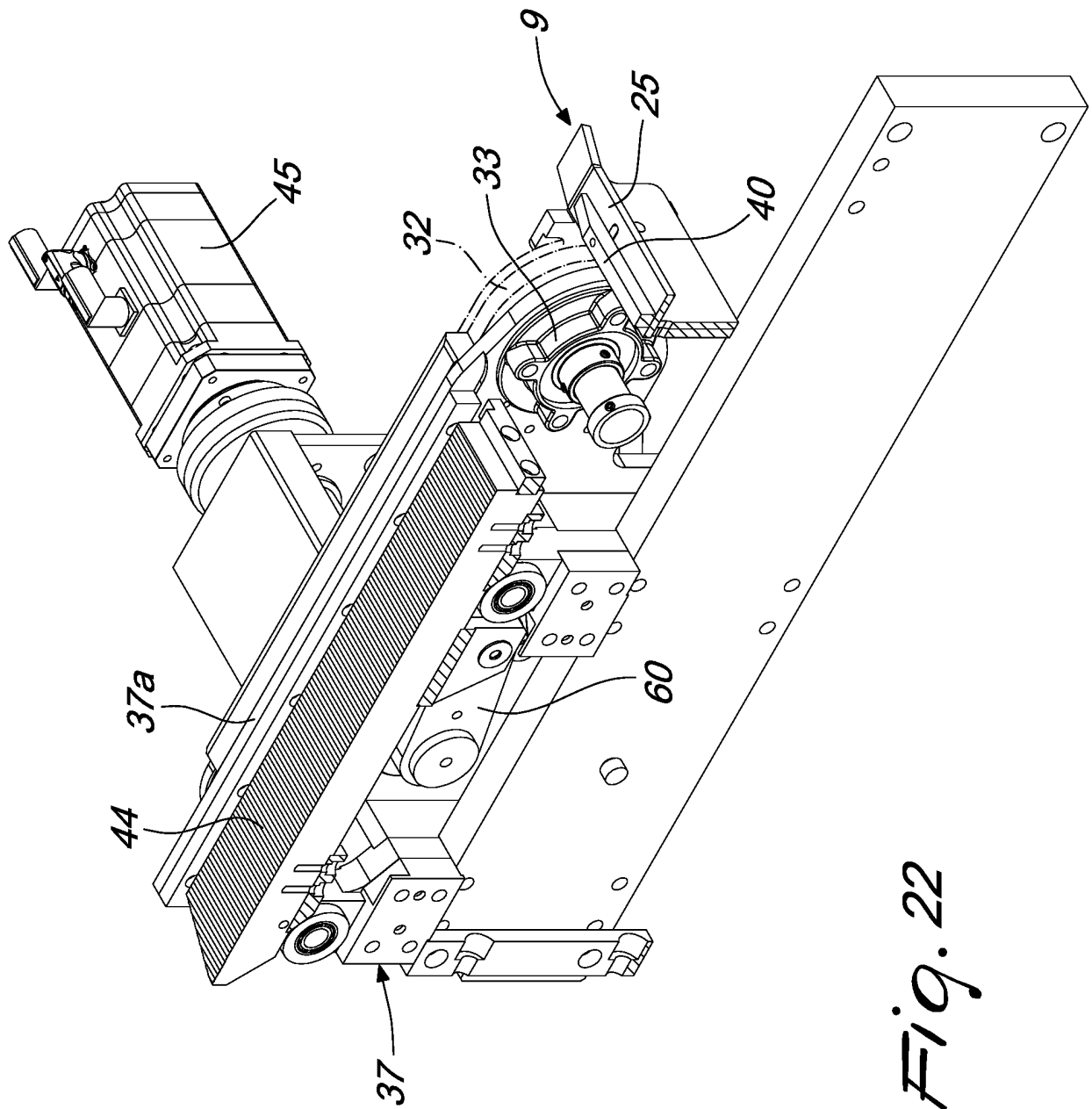


Fig. 22

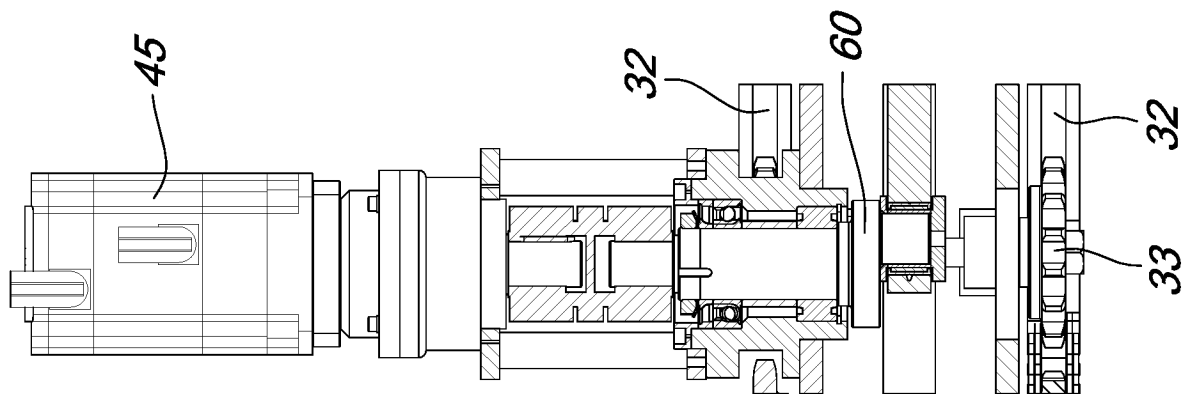


Fig. 24

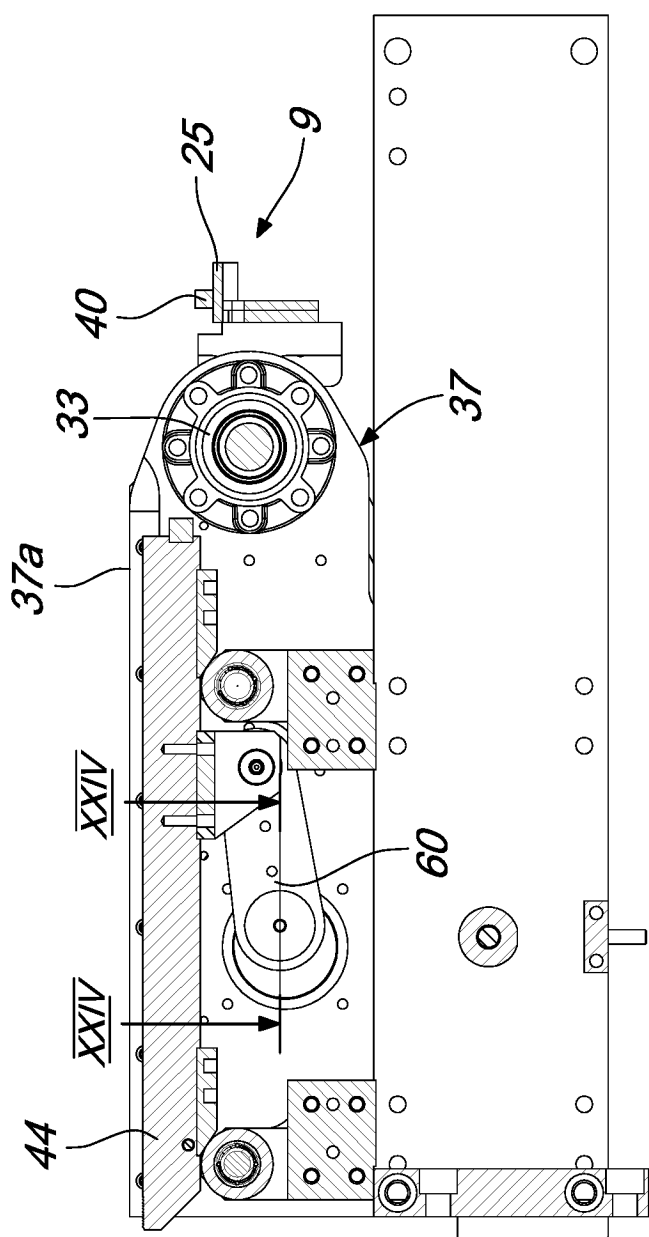


Fig. 23

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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