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(54) Nailing machine for assembling pallets made of wood or the like, with variable nailing positions

(57) A nailing machine for assembling pallets made of wood or the like with variable nailing positions, the machine comprising a nailing station (2, 2a) in which a supporting structure (3, 3a) is arranged for nailing clamps (4, 5, 4a, 5a, 6a, 7a) which face in an upper region a surface (8) for the support and advancement of the pallets (9) to be assembled, the machine further comprising means (15, 15a) for varying the position of at least some of the nailing clamps (4, 5, 4a, 5a, 6a, 7a) along an adjustment direction (10) which is substantially parallel to the advancement direction (10) of the pallets (9) on the support and advancement surface (8).

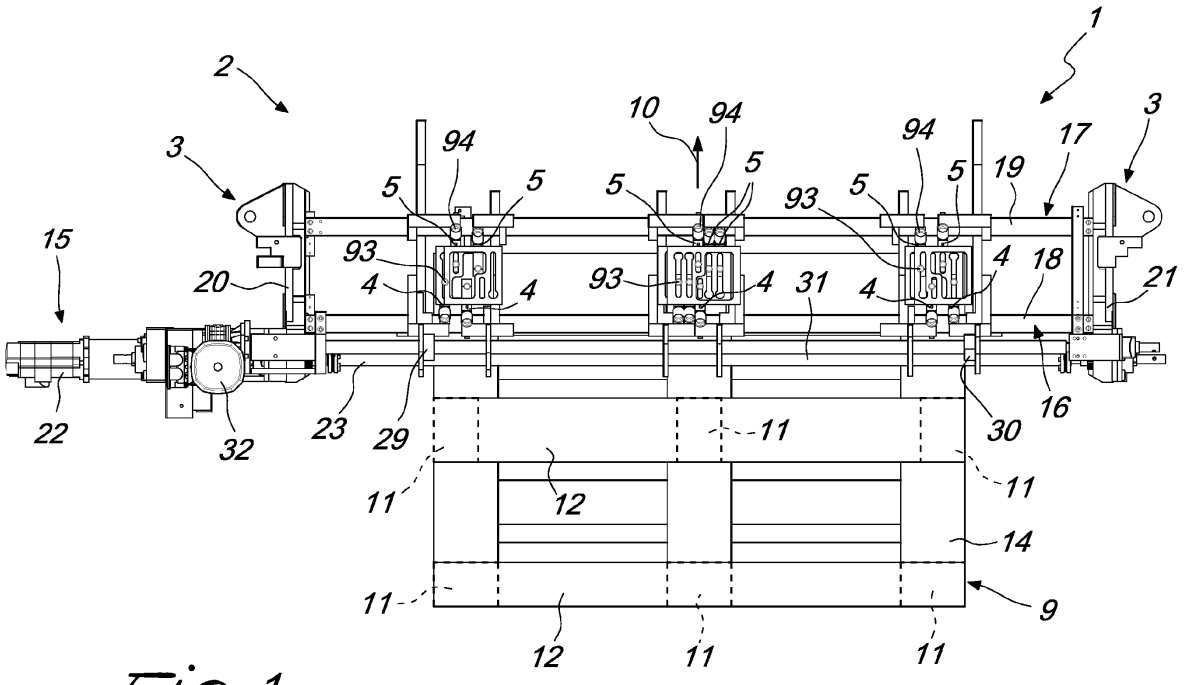

Fig. 1

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Description

[0001] The present invention relates to a nailing machine for assembling pallets made of wood or the like, with variable nailing positions.

[0002] As is known, pallets made of wood are usually constituted by a loading surface, also known as a lid, constituted by two layers of laterally adjacent stringers which are superimposed so that the stringers of one layer are parallel to each other and perpendicular to the stringers of the other layer and by feet or blocks which are fixed below the lid so as to keep it raised with respect to the resting surface. Usually there are three rows of blocks and each one of these three rows is usually composed of three blocks, mutually spaced so that the pallet can be "straddled" by lifting devices on any one of its four sides. Usually, the lid has a rectangular plan shape and the blocks of the three rows are connected one another not only by the lid but also by three bottom stringers, which are arranged parallel to the longer sides of the lid and nailed to the lower face of the blocks.

[0003] Wood pallets are assembled on nailing machines, which are fed with the lid, preassembled on another machine, and with the three rows of blocks to be nailed to the lid or with the lid already assembled to the blocks and with the bottom stringers to be nailed to the lower face of the blocks.

[0004] At the nailing station there is a support and advancement surface for the pallets, which are made to advance on this surface along an advancement direction.

[0005] In the nailing station a plurality of nailing clamps are provided, arranged along an ideal band which faces in an upper region the support and advancement surface of the pallets and is oriented at right angles to the advancement direction of the pallets along said surface.

[0006] The pallets are made to advance intermittently along the advancement direction so as to arrange, in each instance, a row of blocks at the ideal band cited above, and the nailing clamps are actuated so as to nail, in each instance, one row of blocks to the lid or one bottom stringer to a row of blocks.

[0007] Each nailing head comprises a nailing clamp provided with a passage, in which a nail is cyclically inserted and which holds the nail to be driven. Each nailing clamp is provided with a nailing piston, which protrudes upward from the corresponding nailing clamp and which, with its lower end, is inserted in said passage. The nailing clamps are mounted on a supporting structure, which can move along a vertical direction in order to actuate the supporting of the nailing clamps by the region of the lid of the pallet or of the bottom stringer that, in each instance, is arranged in the nailing station or in order to lift them with respect to the lid in order to allow the advancement of the pallet along the advancement direction.

[0008] Above the nailing pistons an actuation element is provided, usually constituted by a horizontal beam, which is oriented at right angles to the advancement direction and can move vertically downward in order to actuate the lowering of the nailing pistons inside the nailing clamps and therefore drive the nails into the lid or into the bottom stringer and into the blocks, joining them to each other, or upward in order to retract the pistons and free the passage of the nailing clamps, which is fed with another nail to be used in the next nailing process.

[0009] Theoretically, a number of nailing clamps equal to the number of nails to be used would be needed in order to assemble a row of blocks to the lid or to the corresponding bottom stringer; however, for allowing the machine to perform nailing with different arrangements and numbers of nails according to the type of pallet to be assembled, there is usually a larger number of nailing clamps and then only the ones actually necessary for the type of pallet being manufactured are used.

[0010] Usually, the blocks to be applied to a lid are mutually identical and the clamps used for one type of pallet are the same. In this case, in order to complete the assembly of a pallet, the same number of nailing beats is needed as there are rows of blocks, usually three, arranged at right angles to the advancement direction of the pallet.

[0011] Some types of pallets are instead provided with blocks that are not of the same size. These types of pallets require a different arrangement of the nails in the several rows of blocks. In order to meet this requirement, it is possible to provide, at the nailing station, an adequate number of nailing clamps or perform a plurality of fastening beats for each row of blocks.

[0012] The first solution suffers the drawback of complicating considerably the provision and management of the machine.

[0013] The second solution suffers the drawback of reducing the productivity of the machine significantly.

[0014] The aim of the present invention is to solve the problem described above, by devising a nailing machine for assembling pallets made of wood or the like that is relatively simple to provide and manage and can ensure high productivity.

[0015] Within this aim, an object of the invention is to provide a machine that can assemble a pallet with a number of nailing beats equal to the number of rows of blocks to be assembled to the lid or to the bottom stringers.

[0016] Another object of the invention is to provide a machine that can adapt extremely easily and quickly to different types of pallets to be assembled.

[0017] Another object of the invention is to provide a machine that has high precision and reliability in use.

[0018] This aim and these and other objects that will become better apparent hereinafter are achieved by a nailing machine for assembling pallets made of wood or the like, comprising a nailing station in which a supporting structure is arranged for nailing clamps which face in an upper region a surface for the support and advancement of the pallets to be assembled, characterized in that it comprises means for varying the position of at least some of said nailing clamps along an adjustment direction

which is substantially parallel to the advancement direction of the pallets on said support and advancement surface.

[0019] Further characteristics and advantages of the invention will become better apparent from the description of two preferred but not exclusive embodiments of the machine according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figures 1 to 6 are views of the machine in the first embodiment; more particularly:

Figure 1 is a top plan view of the machine, shown only partially for the sake of simplicity and greater clarity;
Figure 2 is a perspective view of a part of the machine;
Figure 3 is an enlarged-scale view of a detail of Figure 2;
Figure 4 is a front elevation view of the same part of the machine shown in the previous figures;
Figure 5 is an enlarged-scale view of a detail of Figure 4;
Figure 6 is a schematic sectional view, taken along the line VI-VI of Figure 4;
Figures 7 to 20 are views of the machine according to the invention in the second embodiment; more particularly:

Figure 7 is a top plan view of a part of the machine;
Figure 8 is a front elevation view of the same part of the machine shown in Figure 7;
Figure 9 is a perspective view of a detail of the machine shown in Figures 7 and 8 relating to a nailing clamp with a corresponding supporting element and with the corresponding means for varying its position;
Figure 10 is again a perspective view of the same detail of Figure 9, taken from a different angle and with some elements omitted for greater clarity;
Figure 11 is a side elevation view of the detail of Figures 9 and 10;
Figure 12 is a schematic sectional view, taken along the line XII-XII, of Figure 11;
Figure 13 is a schematic sectional view, taken along the line XIII-XIII, of Figure 11;
Figure 14 is a perspective view of a detail of the machine shown in Figures 7 and 8 relating to another nailing clamp with a corresponding supporting element and with the corresponding means for varying its position;
Figure 15 is a side elevation view of the detail of Figure 14;
Figure 16 is a schematic sectional view, taken along the line XVI-XVI, of Figure 15;
Figure 17 is a perspective view of a detail of the machine shown in Figures 7 and 8 relating to a further nailing clamp with a corresponding supporting element and with the corresponding means for varying its position;
Figure 18 is again a perspective view of the same detail of Figure 17, taken from a different angle;
Figure 19 is a side elevation view of the detail of Figures 17 and 18;
Figure 20 is a schematic sectional view, taken along the line XX-XX, of Figure 19.

[0020] Due to its complexity and dimensions, the machine according to the invention has been illustrated only with regard to the parts necessary for understanding the present invention and many parts of the machine have been omitted in order to render visible the elements to which the present invention refers. In any case, the parts shown can be identified clearly and located just as easily on a nailing machine for assembling pallets made of wood or the like by the person skilled in the art, also in light of the description that follows.

[0021] The parts that are not shown or described are constituted by parts that are per se known in conventional nailing machines.

[0022] With reference to the figures, the machine according to the invention, generally designated in the two embodiments by the reference numerals 1 and 1a, comprises a nailing station 2, 2a in which a supporting structure 3, 3a is arranged for nailing clamps 4, 5, 4a, 5a, 6a, 7a that face in an upper region a support and advancement surface 8, which is preferably horizontal and on which the pallets 9 to be assembled are caused to advance with an intermittent motion along an advancement direction 10 so as to arrange, in each instance, a row of blocks 11, which are surmounted by a corresponding bottom stringer 12 or by a lid 14, below the nailing clamps 4, 5, 4a, 5a, 6a, 7a, which as in conventional machines are arranged within an ideal band that faces the support and advancement surface 8 and is oriented at right angles to the advancement direction 10.

[0023] According to the invention, the machine comprises means 15, 15a for varying the position of at least some of the nailing clamps 4, 5, 4a, 5a, 6a, 7a along an adjustment direction which is substantially parallel to the advancement direction 10. For the sake of simplicity, hereinafter, the adjustment direction will be designated, like the advancement direction of the pallets 9, by the reference numeral 10.

[0024] In the first embodiment, shown in Figures 1 to 7, the nailing clamps 4, 5 are mounted in groups on supporting elements 16, 17 which are associated, so that they can slide, with the supporting structure 3 along the adjustment direction 10 and the variation means 15 are connected to the supporting elements 16, 17 and can be actuated on command to move the supporting elements 16, 17 along the adjustment direction 10 with respect to the supporting structure 3. In practice, in the first embodiment the nailing clamps 4, 5 can move in groups with

respect to each other so as to vary their mutual distance along the adjustment direction 10.

[0025] More particularly, the supporting elements 16, 17 comprise two supporting bars 18, 19, which are arranged in an upper region and parallel to the support and advancement surface 8 and are oriented at right angles to the advancement direction 10. The supporting bars 18, 19 are associated, at their longitudinal ends, with a respective shoulder 20, 21, which is connected, in a manner known per se, to lifting elements, not shown for the sake of simplicity.

[0026] Each one of the supporting bars 18, 19 supports at least one group of nailing clamps 4, 5 and can move on command, due to the action of the variation means, toward or away from the other supporting bar 19, 18 parallel to the adjustment direction 10. In the embodiment shown in Figures 1 to 6, a group of nailing clamps 4 is provided that is mounted on the supporting bar 18 and a group of nailing clamps 5 that is mounted on the supporting bar 19.

[0027] In this first embodiment, the variation means 15 comprise a first electric servomotor 22, which is mounted on the supporting structure 3 and is connected kinematically to the supporting bars 18, 19. As shown in particular in Figures 2 to 6, the output shaft of the electric servomotor 22 is connected to a shaft 23 that is oriented parallel to the supporting bars 18, 19 and is supported, so that it can rotate about its own axis, by the shoulders 20, 21. A gear is keyed proximate to each axial end of said shaft 23 and meshes, by means of two diametrically opposite regions thereof, with racks 25, 26 that are fixed, by means of plates 27, 28, respectively to the supporting bar 18 and to the supporting bar 19. In this manner, the actuation of the first servomotor 22 causes the approach or spacing of the supporting bars 18, 19 parallel to the advancement direction 10 and therefore varies the distance between the two groups of nailing clamps 4, 5 mounted on the supporting bars 18, 19.

[0028] Advantageously, at least some of the nailing clamps 4, 5 are mounted so that they can slide along the corresponding supporting bar 18, 19 and means are provided for adjusting their position along the corresponding supporting bar 18, 19, i.e., at right angles to the advancement direction 10. In the first embodiment, the nailing clamps 4 located proximate to the longitudinal ends of the supporting bar 18 are jointly connected to blocks 29, 30 in which a female thread is defined which mates with a threaded portion of a shaft 31 supported, so that it can rotate about its own axis, which is oriented parallel to the supporting bars 18, 19, by the shoulders 20, 21 and is connected kinematically to a second electric servomotor 32. Substantially, by actuating the second servomotor 32, due to the coupling between the threaded portions of the shaft 31 and the female threads defined in the blocks 29, 30, the blocks 29, 30 are moved along the supporting bar 18 and thus the position of the nailing clamps 4, which are integral with the blocks 29, 30, at right angles to the advancement direction 10, is varied.

[0029] In the second embodiment, the nailing clamps 4a, 5a, 6a, 7a are mounted on supporting elements 16a, 17a which are associated with the supporting structure 3a. At least some of the nailing clamps 4a, 5a, 6a, 7a are associated, so as they can slide along the adjustment direction 10, with the supporting elements 16a, 17a and the variation means 15a operate individually on at least some of the nailing clamps 4a, 5a, 6a, 7a to cause their individual sliding with respect to the corresponding supporting element 16a, 17a along the adjustment direction 10.

[0030] In this second embodiment, the supporting elements 16a, 17a comprise two supporting bars 18a, 19a, which are arranged in an upper region and parallel to the support and advancement surface 8 and are oriented at right angles to the advancement direction 10. The two supporting bars 18a, 19a are fixed, at their longitudinal ends, to a pair of shoulders 20a, 21a that are part of the supporting structure 3a. The shoulders 20a, 21a are connected to lifting elements, of a known type and not shown for the sake of simplicity, that can be actuated in order to lift or lower the supporting bars 18a, 19a with respect to the support and advancement surface 8.

[0031] In the embodiment shown in Figures 7 to 20, the nailing clamps designated by the reference numeral 7a are mounted on the supporting bars 18a, 19a in a fixed manner along a direction that is parallel to the advancement direction 10. The nailing clamp designated by the reference numeral 4a is supported by the supporting bar 19a with the possibility of moving parallel to the advancement direction 10, and likewise the nailing clamps 5a, 6a are supported by the supporting bar 18a with the possibility of moving parallel to the advancement direction 10.

[0032] More particularly, as shown in Figures 9 to 13, the nailing clamp 4a is supported by a block 33a composed of two half-shells 34a, 35a that are fastened around the supporting bar 19a. The nailing clamp 4a is fixed to a slider 36a, which can slide along a guide 37a defined by plates 38a, 39a fixed to the block 33a and is oriented parallel to the advancement direction 10.

[0033] The variation means 15a, relating to the nailing clamp 4a, comprise at least one linear actuator that is interposed between the block 33a and the slider 36a and can be actuated in order to cause the sliding, in one direction or in the opposite direction, of the slider 36a along the guide 37a and therefore in order to vary the position of the nailing clamp 4a in relation to the supporting bar 19a parallel to the advancement direction 10. Said linear actuator comprises two fluid-operated cylinders 40a, 41 a, which are interposed in series between the block 33a and the slider 36a. More particularly, the fluid-operated cylinder 40a is connected by means of the stem 42a of its piston to the half-shell 35a of the block 33a and is connected by means of its body to the body of the fluid-operated cylinder 41a, which in turn is connected by means of the stem 43a of its piston to the slider 36a by means of a plurality of blocks and plates 44a, 45a, 46a,

47a. In this manner, by means of the actuation of the two fluid-operated cylinders 40a, 41 a it is possible to actuate the movement of the nailing clamp 4a along the adjustment direction 10, in relation to the supporting bar 19a, stopping it in three different positions.

[0034] It should be noted that in Figure 10 the representation of a covering element 48a has been omitted in order to allow a view of the plate 45a.

[0035] As shown particularly in Figures 14 to 16, the nailing clamp 5a is supported by a block 53a, which is composed of two half-blocks 54a, 55a fixed to the supporting bar 18a. The nailing clamp 5a is fixed to a slider 56a which can slide along a guide 57a, which is defined by plates 58a, 59a, fixed to the block 53a and is oriented parallel to the advancement direction 10.

[0036] The variation means 15a, relating to the nailing clamp 5a, comprise at least one linear actuator, which is interposed between the half-block 55a and the slider 56a and can be actuated in order to cause the sliding, in one direction or in the opposite direction, of the slider 56a along the guide 57a and therefore vary the position of the nailing clamp 5a in relation to the supporting bar 18a parallel to the advancement direction 10. Said linear actuator comprises two fluid-operated cylinders 60a, 61a interposed in series between the block 53a and the slider 56a. More particularly, the fluid-operated cylinder 60a is connected by means of the stem 62a of its piston to the half-block 55a and by means of its body to the body of the fluid-operated cylinder 61a, which in turn is connected by means of the stem 63a of its piston to the slider 56a by means of a plurality of plates and blocks 64a, 65a, 66a, 67a. In this manner, by the actuation of the two fluid-operated cylinders 60a, 61a it is possible to actuate the movement of the nailing clamp 5a along the adjustment direction 10, in relation to the supporting bar 18a, stopping it in three different positions.

[0037] In a similar manner, as shown particularly in Figures 17 to 20, the nailing clamp 6a is supported by a block 73a composed of two half-blocks 74a, 75a, which are fixed to the supporting bar 18a. The nailing clamp 5a is fixed to a slider 76a, which can slide along a guide 77a, which is defined by plates 78a, 79a fixed to the block 73a and is oriented parallel to the advancement direction 10.

[0038] The variation means 15a relating to the nailing clamp 6a comprise at least one linear actuator which is interposed between the block 73a and the slider 76a and can be actuated in order to cause the sliding, in one direction or in the opposite direction, of the slider 76a along the guide 77a and therefore in order to vary the position of the nailing clamp 6a in relation to the supporting bar 18a parallel to the advancement direction 10. Said linear actuator comprises two fluid-operated cylinders 80a, 81 a, which are interposed in series between the block 73a and the slider 76a. More particularly, the fluid-operated cylinder 80a is connected by means of the stem 82a of its piston to the half-block 75a and by means of its body to the body of the fluid-operated cylinder 81a, which in turn is connected by means of the stem 83a of its piston to the slider 76a by means of a plurality of plates and blocks 84a, 85a, 86a, 87a, 88a. In this manner, by the actuation of the two fluid-operated cylinders 80a, 81a it is possible to actuate the movement of the nailing clamp 6a in relation to the supporting bar 18a along the adjustment direction 10, stopping it in three different positions.

[0039] For the sake of descriptive completeness, it should be noted that connection bars 90a, 91a are fixed to the blocks and protrude toward the supporting bar 19a.

[0040] In this second embodiment also, some of the nailing clamps can be moved at right angles to the advancement direction 10. More particularly, as shown in particular in Figure 7, the nailing clamps 7a that are closest to the longitudinal ends of the supporting bar 18a are jointly connected to blocks 95a, 96a in which a female thread is defined which is coupled with a corresponding threaded portion of a shaft 97a, which is supported, so that it can rotate about its own axis, oriented parallel to the supporting bars 18a, 19a, by the shoulders 20a, 21a and is connected kinematically to an electric servomotor 98a. Substantially, by actuation of the servomotor 98a, as a consequence of the coupling of the threaded portions of the shaft 97a with the female threads formed in the blocks 95a, 96a, the movement of said blocks 95a, 96a along the supporting bar 18a is induced and therefore the position of the nailing clamps 7a, which are jointly connected to said blocks 95a, 96a at right angles to the advancement direction 10, is varied.

[0041] The variation means 15, 15a, i.e., the servomotor 22 and the fluid-operated cylinders 40a, 41a, 60a, 61a, 80a, 81a, the servomotor 98a as well as the servomotor 32, are functionally connected to an actuation and control element of the electronic type that manages the operation of the machine and actuates the servomotors 22, 32 or the fluid-operated cylinders 40a, 41 a, 60a, 61a, 80a, 81a and the servomotor 98a according to preset nailing programs so as to adapt automatically the position of the nailing clamps 4, 5, 4a, 5a, 6a, 7a to the type of pallet 9 to be assembled.

[0042] For the sake of descriptive completeness, it should be noted that the several nailing clamps 4, 5, 4a, 5a, 6a, 7a, both in the first embodiment and in the second embodiment, are provided with a corresponding piston 93, 93a that protrudes upwardly from the corresponding clamp and can move vertically toward the supporting and advancement surface 8, in a manner known per se, in order to push the corresponding nail, fed by means of a feeding connector 94, 94a, toward the pallet 9 or upward, in order to allow the feeding of a new nail into the nailing clamp 4, 5, 4a, 5a, 6a, 7a through the feeding connector 94, 94a.

[0043] Operation of the nailing machine according to the invention, in the two illustrated embodiments, is as follows.

[0044] Depending on the type of pallet 9 to be assembled, the actuation and control element that manages the operation of the machine according to the invention, by actuating the servomotors 22, 32 in the first embodiment

or the fluid-operated cylinders 40a, 41a, 60a, 61a, 80a, 81a and the servomotor 98a in the second embodiment, arranges the nailing clamps 4, 5, 4a, 5a, 6a, 7a in the correct position for the first nailing beat according to a preset nailing program which is correlated to the pallet 9 to be assembled.

[0045] Subsequently, after the first row of blocks 11 has been positioned, by moving the pallet 9 forward along the advancement direction 10, below the nailing clamps 4, 5 or 4a, 5a, 6a, 7a, the supporting structure 3 or 3a is lowered with respect to the fixed supporting structure of the machine so as to bring the nailing clamps 4, 5 or 4a, 5a, 6a, 7a against the pallet 9, and the pistons 93 or 93a are lowered inside the nailing clamps 4, 5 or 4a, 5a, 6a, 7a in order to drive the corresponding nails into the pallet 9, assembling the blocks 11 to the lid 14 or to the corresponding bottom stringer 12.

[0046] The supporting structure 3 or 3a is then lifted so as to free the pallet 9, which is moved forward on the support and advancement surface 8 until a subsequent row of blocks 11 is located below the nailing clamps 4, 5, or 4a, 5a, 6a, 7a.

[0047] While the pallet 9 advances, if the subsequent fastening beat requires a different arrangement of at least some of the nails along a direction that is parallel to the advancement direction 10, as in the case in which the blocks 11 that belong to the row to be nailed have different dimensions than the blocks 11 of the previous row, the actuation and control element actuates the servomotor 22 or the fluid-operated cylinders 40a, 41a, 60a, 61a, 80a, 81a so as to vary the position of the nailing clamps 4, 5 or 4a, 5a, 6a that must be moved.

[0048] Operation of the machine then continues as already described.

[0049] In practice, in the machine according to the invention, by actuating the servomotor 22, in the first embodiment, or the fluid-operated cylinders 40a, 41a, 60a, 61a, 80a, 81a it is possible to vary the position of at least some of the nailing clamps 4, 5 or 4a, 5a, 6a in order to adapt them to the nailing requirements. In this manner it is possible to limit the number of nailing clamps to be mounted on the machine and/or perform a single nailing beat per row of blocks 11.

[0050] Moreover, by means of the servomotors 32 or 98a it is possible to vary also the position of at least some of the nailing clamps also along a direction at right angles to the advancement direction 10.

[0051] It should be noted that the two embodiments of the invention described above may coexist on the same nailing machine. In fact, the supporting bars 18a, 19a of the second embodiment, instead of being fixed to the shoulders 20a, 21a, may be associated with the shoulders 20a, 21a, so that they can slide along a direction that is parallel to the advancement direction 10 and may be connected kinematically, for example by means of racks and pinions, to the output shaft of a servomotor that can be actuated in order to cause the mutual approach or spacing of the supporting bars 18a, 19a, in the same manner as described with reference to the first embodiment shown in Figures 1 to 6. In this manner, the nailing clamps 4a, 5a, 6a can be moved as a group together with the nailing clamps 7a or individually parallel to the advancement direction 10.

[0052] In practice it has been found that the nailing machine according to the invention fully achieves the intended aim, since due to the possibility of moving the nailing clamps individually and/or as a group along a direction which is parallel to the advancement direction of the pallets to be assembled it is possible to meet the several nailing requirements with a limited number of nailing clamps by working with a number of nailing beats that is equal to the rows of blocks for each pallet to be assembled, therefore maintaining a high productivity.

[0053] The machine thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0054] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0055] The disclosures in Italian Patent Application No. MI2011A000020 from which this application claims priority are incorporated herein by reference.

[0056] 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 nailing machine for assembling pallets (9) made of wood or the like, comprising a nailing station (2, 2a) in which a supporting structure (3, 3a) is arranged for nailing clamps (4, 5, 4a, 5a, 6a, 7a) which face in an upper region a surface (8) for the support and advancement of the pallets (9) to be assembled, **characterized in that** it comprises means (15, 15a) for varying the position of at least some of said nailing clamps (4, 5, 4a, 5a, 6a, 7a) along an adjustment direction (10) which is substantially parallel to the advancement direction (10) of the pallets (9) on said support and advancement surface (8).

2. The machine according to claim 1, **characterized in that** at least some of said nailing clamps (4, 5) are mounted in groups on supporting elements (16, 17), which are associated slidingly with said supporting structure (3) along said adjustment direction (10), said variation means (15) being connected to said supporting elements (16, 17) and being actuatable on command to move said supporting elements (16,

17) along said adjustment direction (10) with respect to said supporting structure (3).

3. The machine according to claims 1 and 2, **characterized in that** said supporting elements (16, 17) comprise two supporting bars (18, 19), which are arranged at right angles to said advancement direction (10) and are substantially parallel to said support and advancement surface (8), each one of said supporting bars (18, 19) supporting at least one group of nailing clamps (4, 5); said supporting bars (18, 19) being movable, by the action of said variation means (15), toward or away from each other with respect to said supporting structure (3), parallel to said adjustment direction (10).

4. The machine according to one or more of the preceding claims, **characterized in that** said variation means (15) comprise at least one first electric servomotor (22), which is mounted on said supporting structure (3) and is connected kinematically to said supporting bars (18, 19).

5. The machine according to one or more of the preceding claims, **characterized in that** the output shaft of said electric servomotor (22) is connected to at least one gear (24) which meshes, at two diametrically opposite regions thereof, with two mutually opposite racks (25, 26), which are oriented parallel to said adjustment direction (10) and are fixed respectively to a corresponding supporting bar (18, 19) of said supporting bars (18, 19).

6. The machine according to one or more of the preceding claims, **characterized in that** said nailing clamps (4a, 5a, 6a, 7a) are mounted on supporting elements (16a, 17a) which are associated with said supporting structure (3a), at least some of said nailing clamps (4a, 5a, 6a, 7a) being associated slidingly with said supporting elements (16a, 17a) along said adjustment direction (10) and said variation means (15a) acting individually on said at least some of said nailing clamps (4a, 5a, 6a, 7a) for their individual sliding with respect to the corresponding supporting element (16a, 17a) along said adjustment direction (10).

7. The machine according to one or more of the preceding claims, **characterized in that** said variation means (15a) comprise, for each nailing clamp (4a, 5a, 6a, 7a) of said at least some of said nailing clamps (4a, 5a, 6a, 7a), at least one linear actuator (40a, 41a, 60a, 61a, 80a, 81a) which is interposed between a nailing clamp (4a, 5a, 6a) and the corresponding supporting element (16a, 17a).

8. The machine according to one or more of the preceding claims, **characterized in that** said at least one linear actuator (40a, 41a, 60a, 61a, 80a, 81a) comprises two fluid-operated cylinders (40a, 41a; 60a, 61a; 80a, 81a) which are interposed in series between a nailing clamp (4a, 5a, 6a) and the corresponding supporting element (16a, 17a).

9. The machine according to one or more of the preceding claims, **characterized in that** said supporting elements (16a, 17a) are constituted by said two supporting bars (18, 19).

10. The machine according to one or more of the preceding claims, **characterized in that** at least some of said nailing clamps (4, 5, 4a, 5a, 6a, 7a) are movable on command with respect to the supporting bar (18, 19, 18a, 19a) on which they are mounted, along a direction which is substantially parallel to said support and advancement surface (8) and perpendicular to said advancement direction (10).

11. The machine according to one or more of the preceding claims, **characterized in that** it comprises an actuation and control element of the programmable electronic type, which is adapted to control said variation means (15, 15a) according to programs preset as a function of the type of pallet (9) to be assembled.

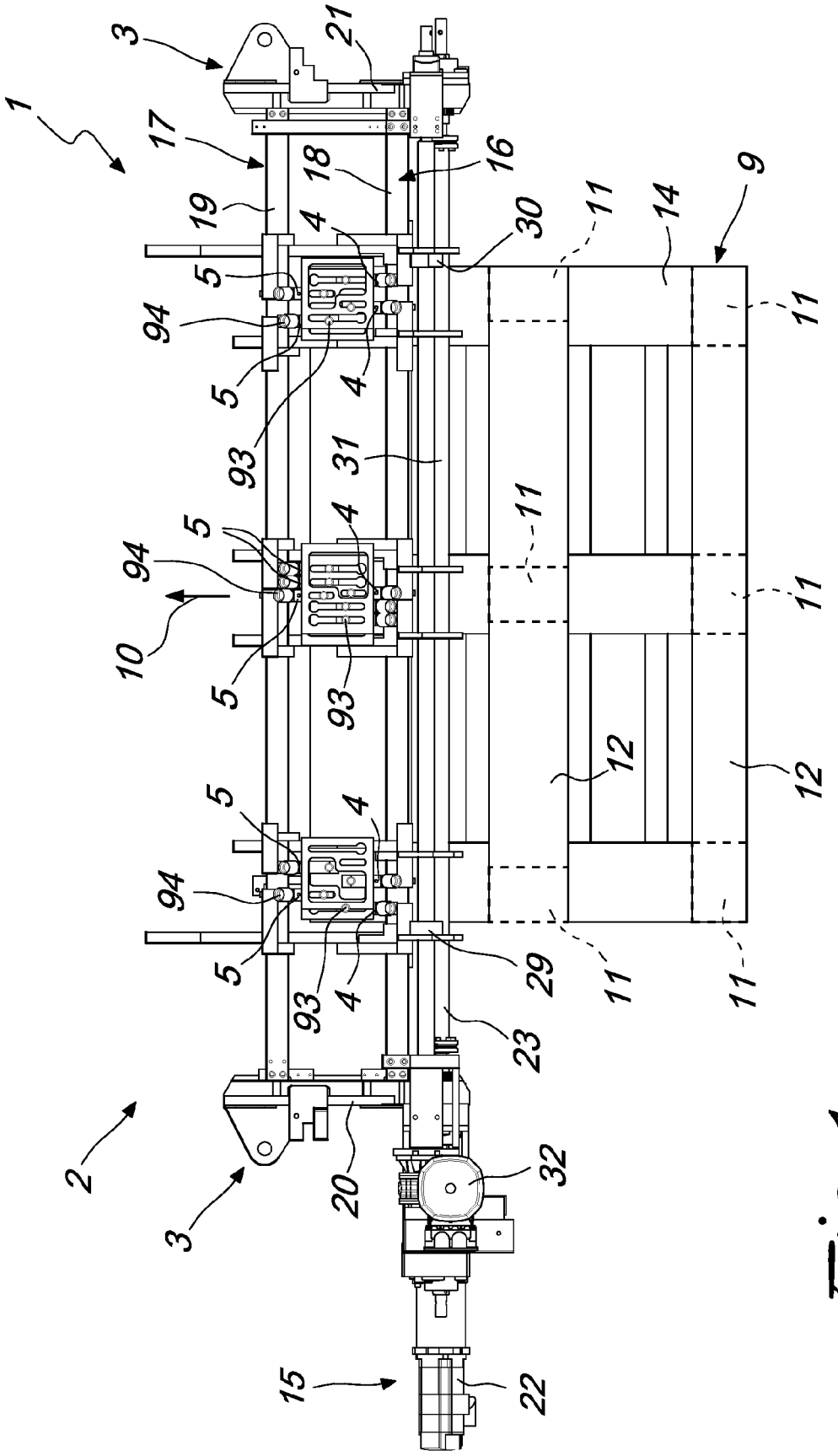

Fig. 1

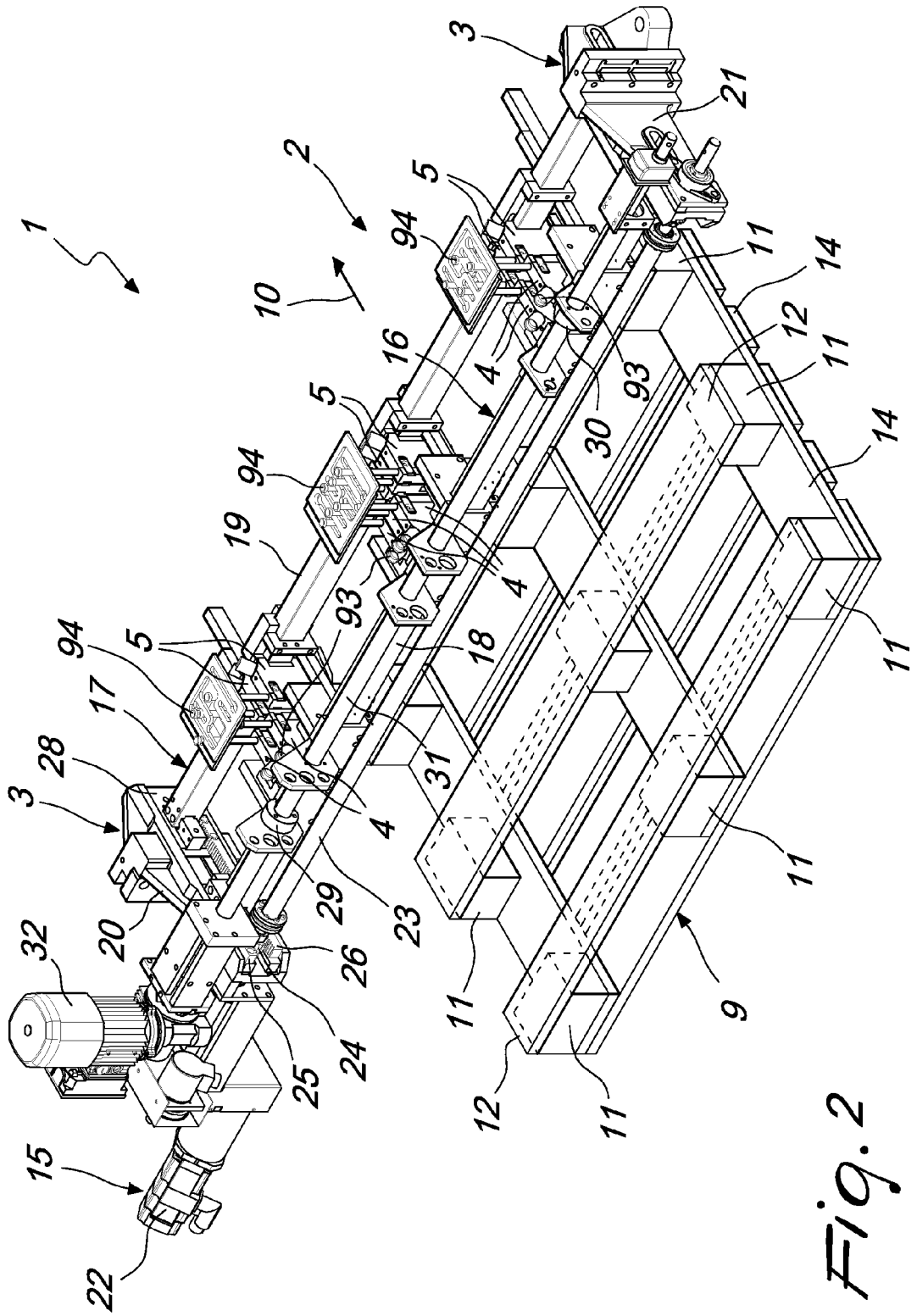
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Fig. 2

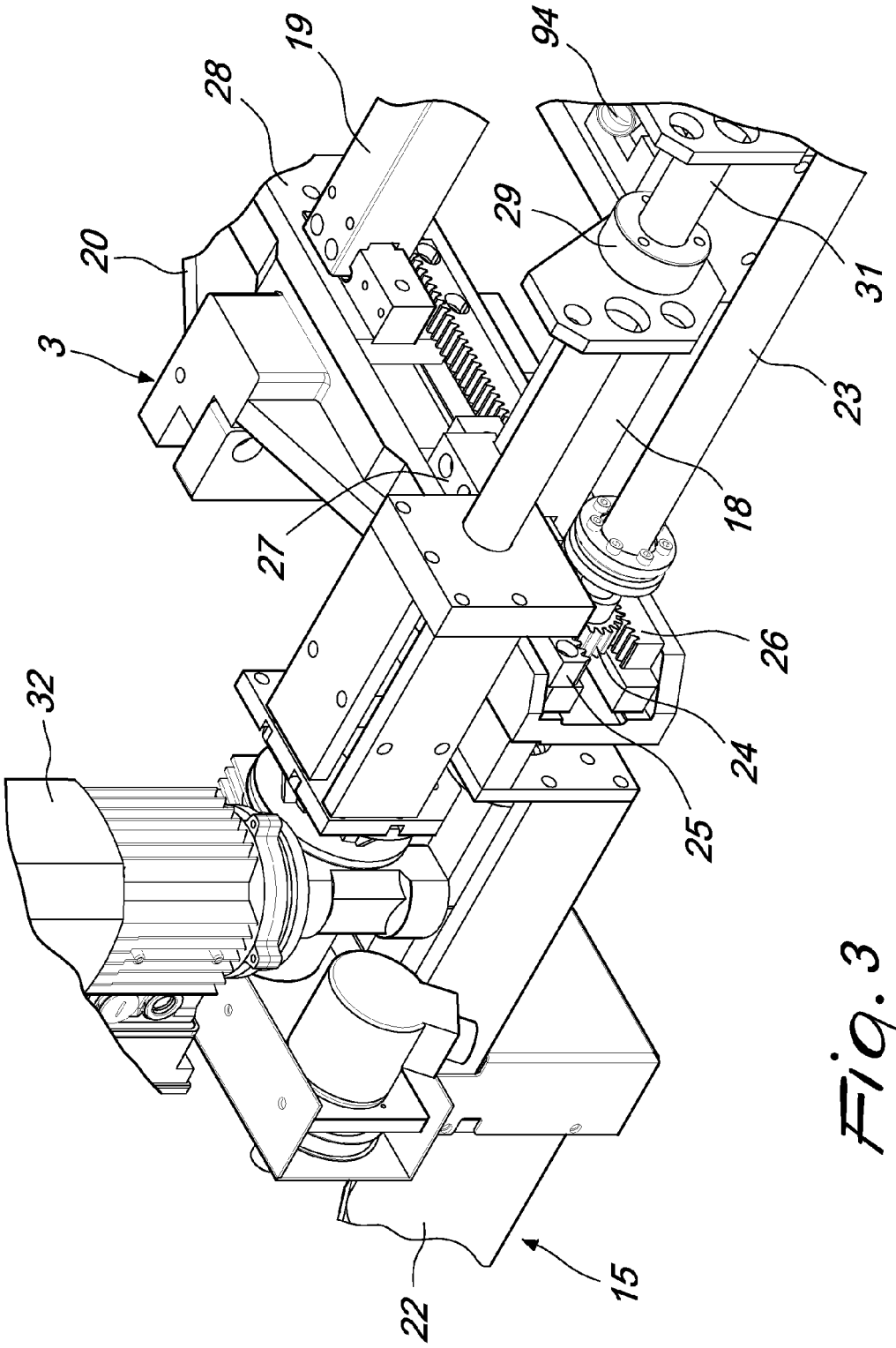


Fig. 3

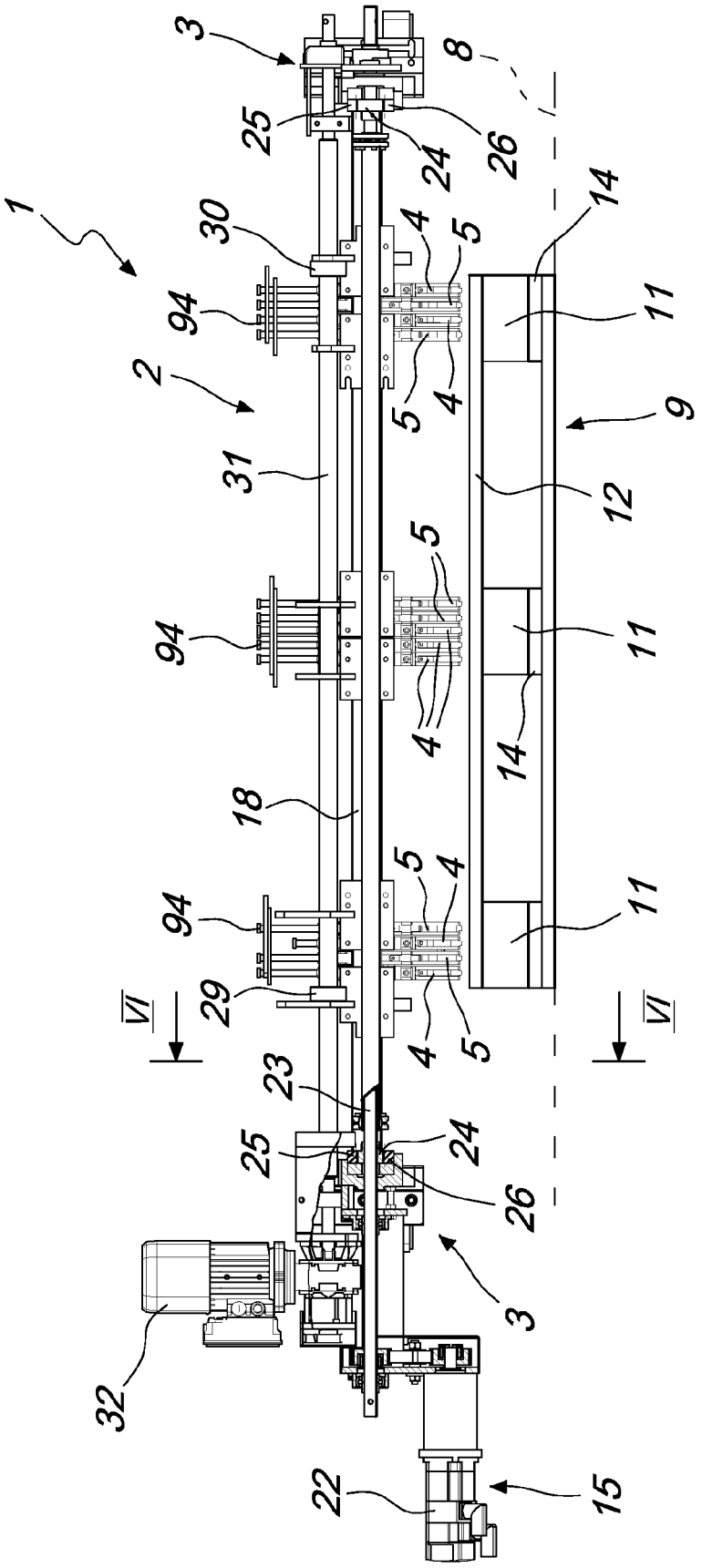


Fig. 4

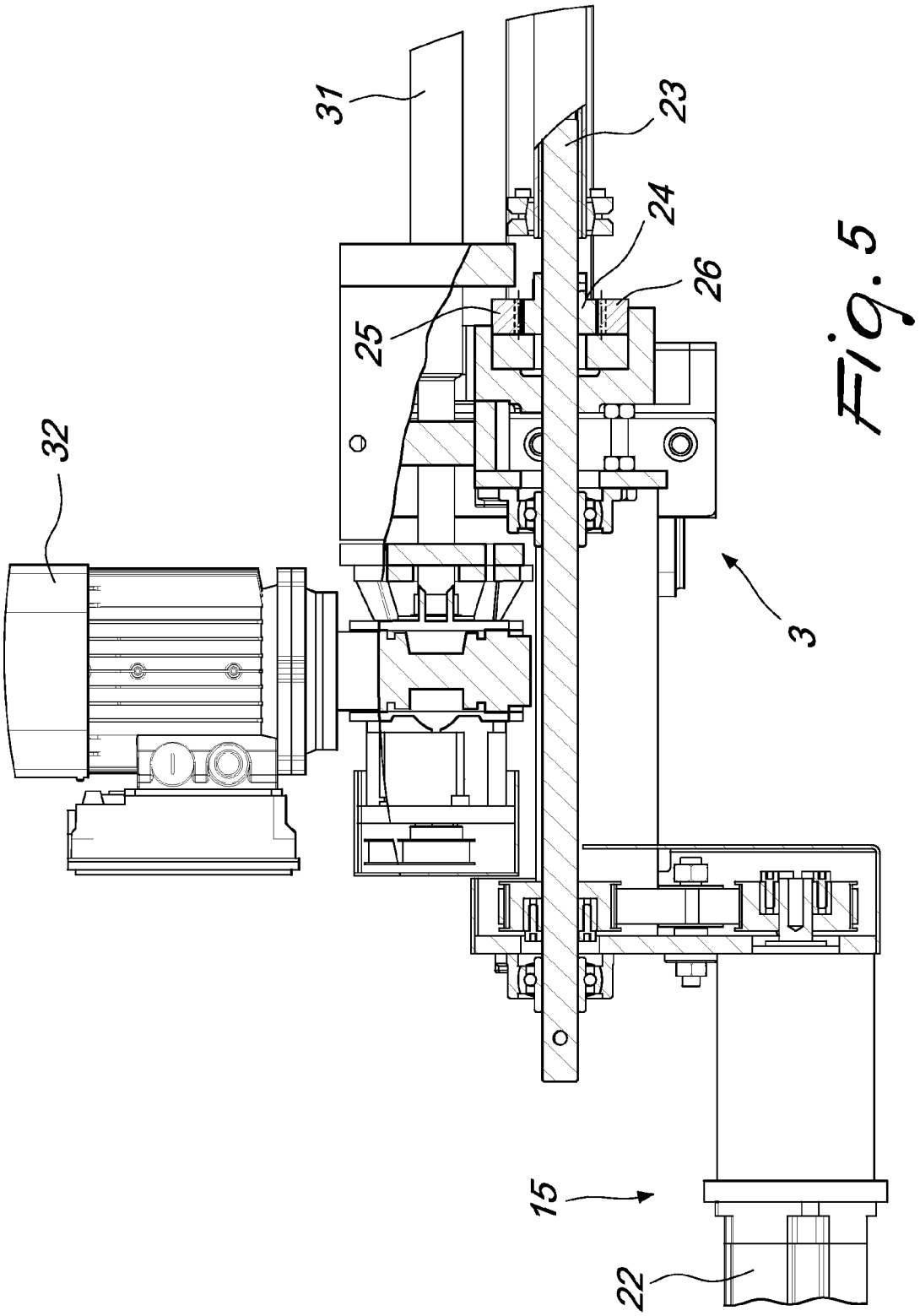
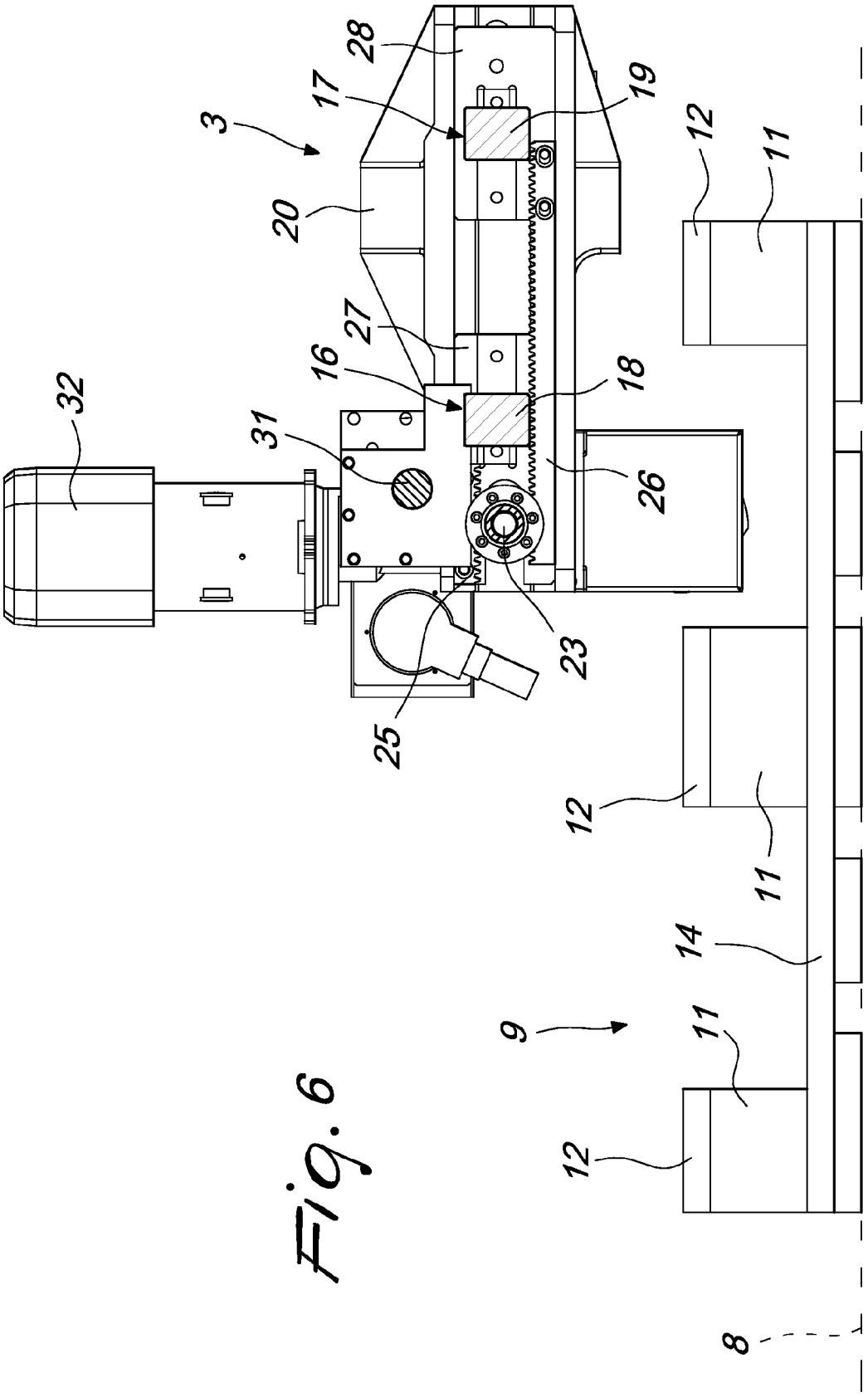


Fig. 5



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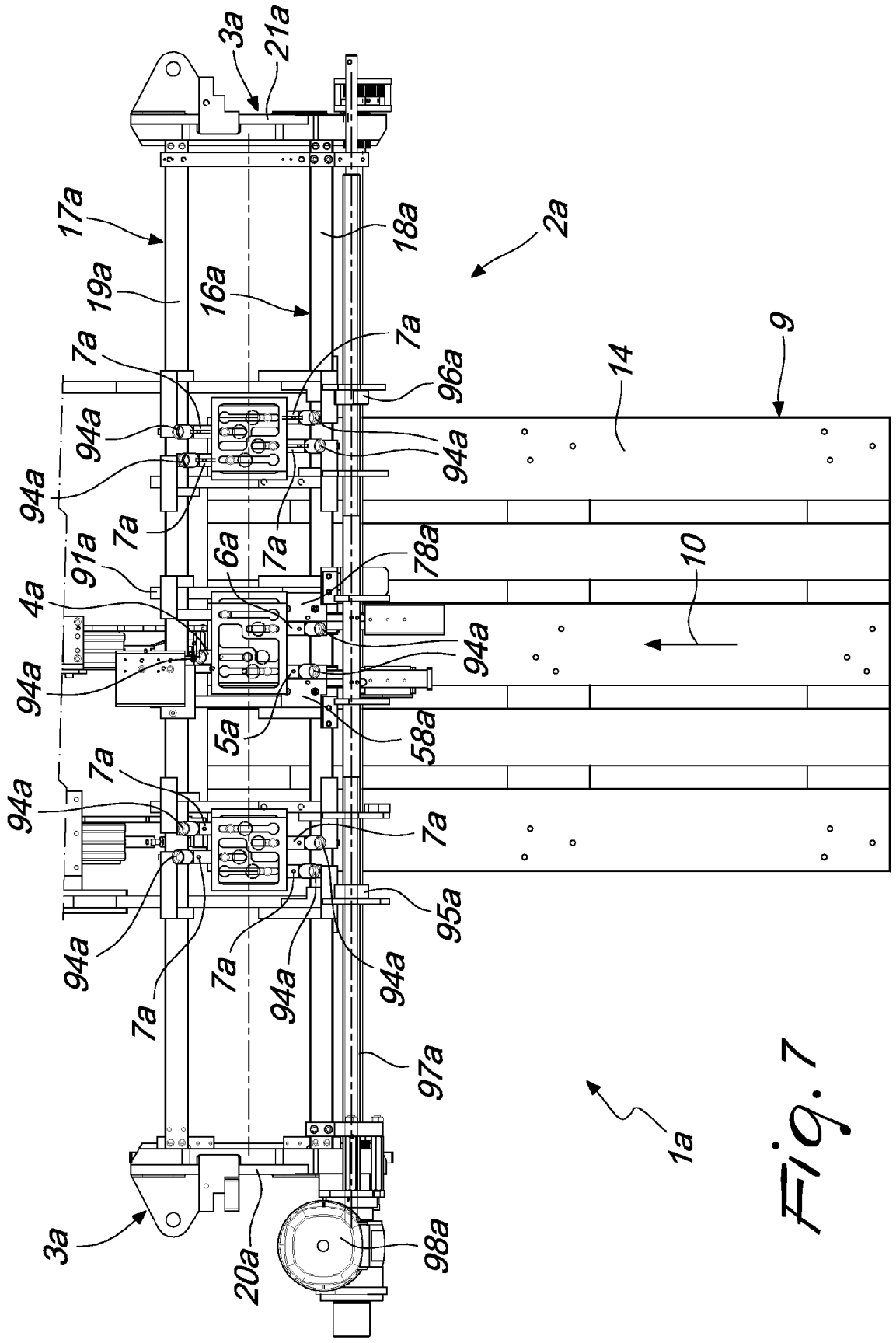
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Fig. 7

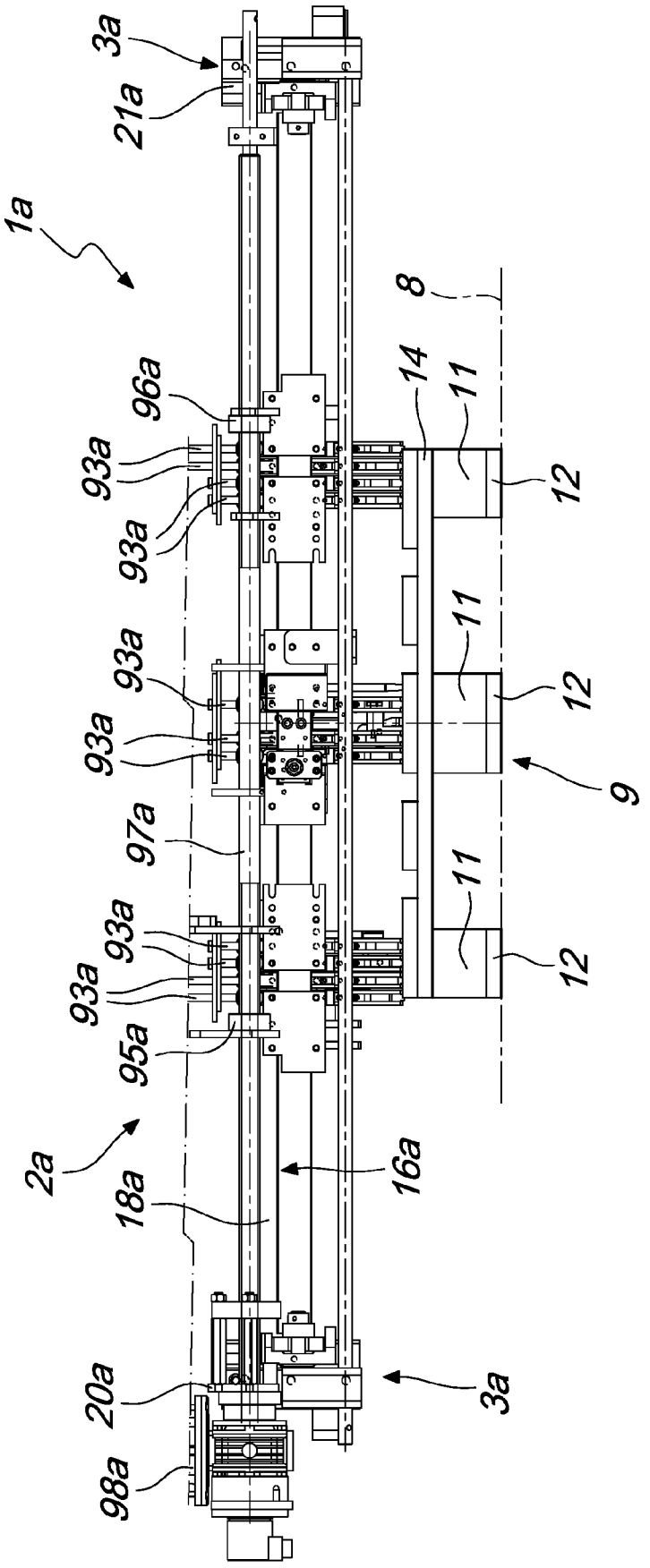
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Fig. 8

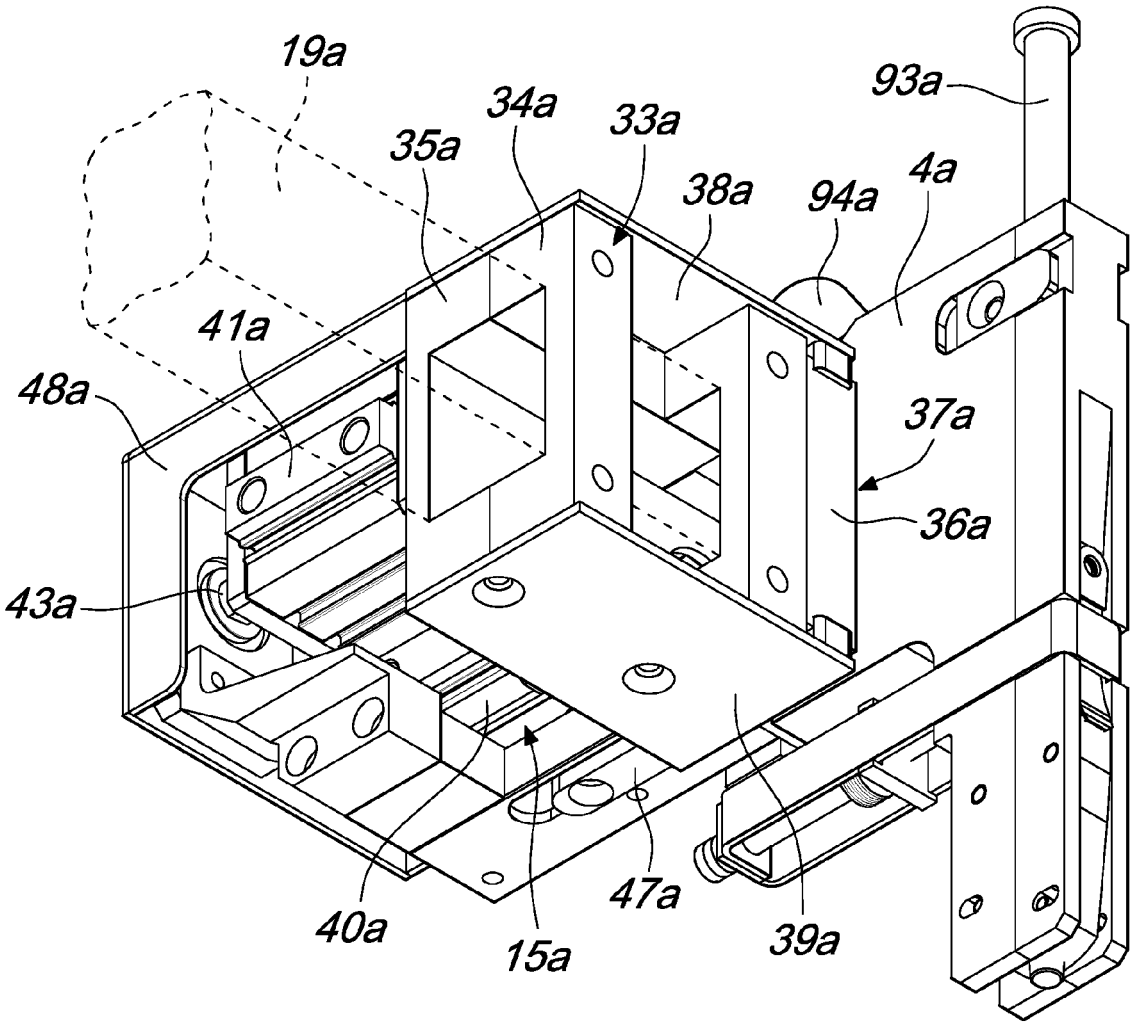
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Fig. 9

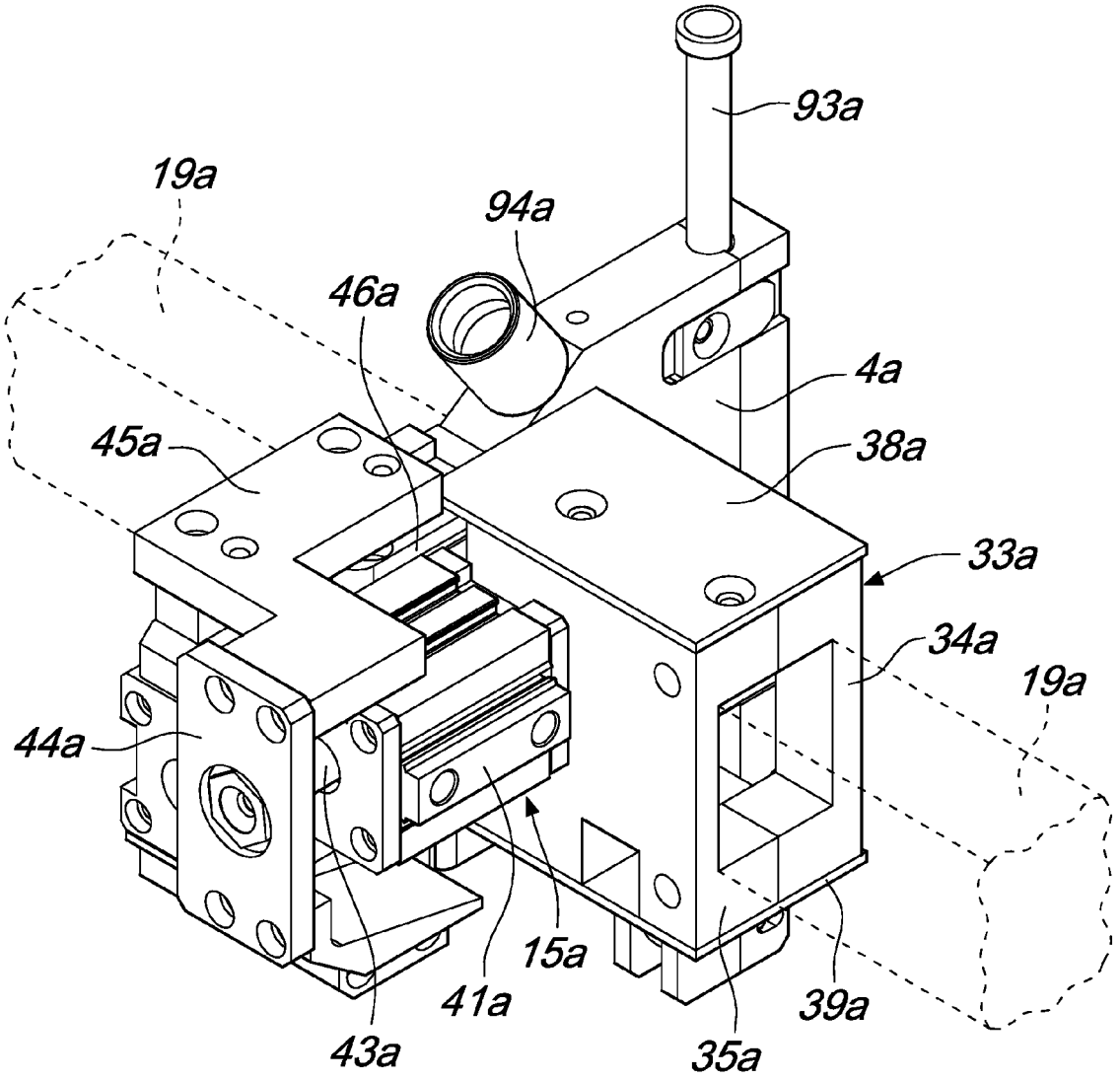

Fig. 10

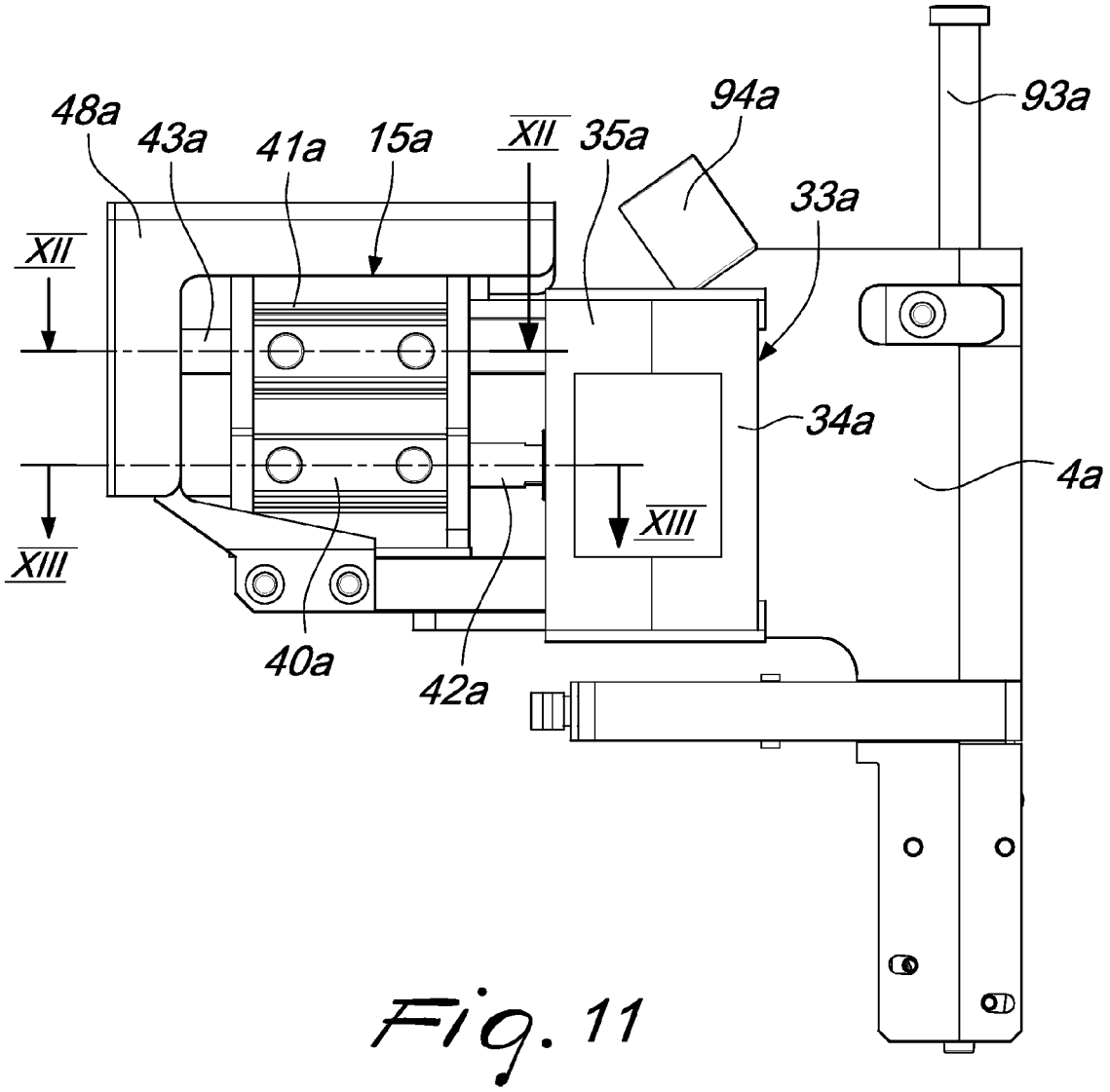

Fig. 11

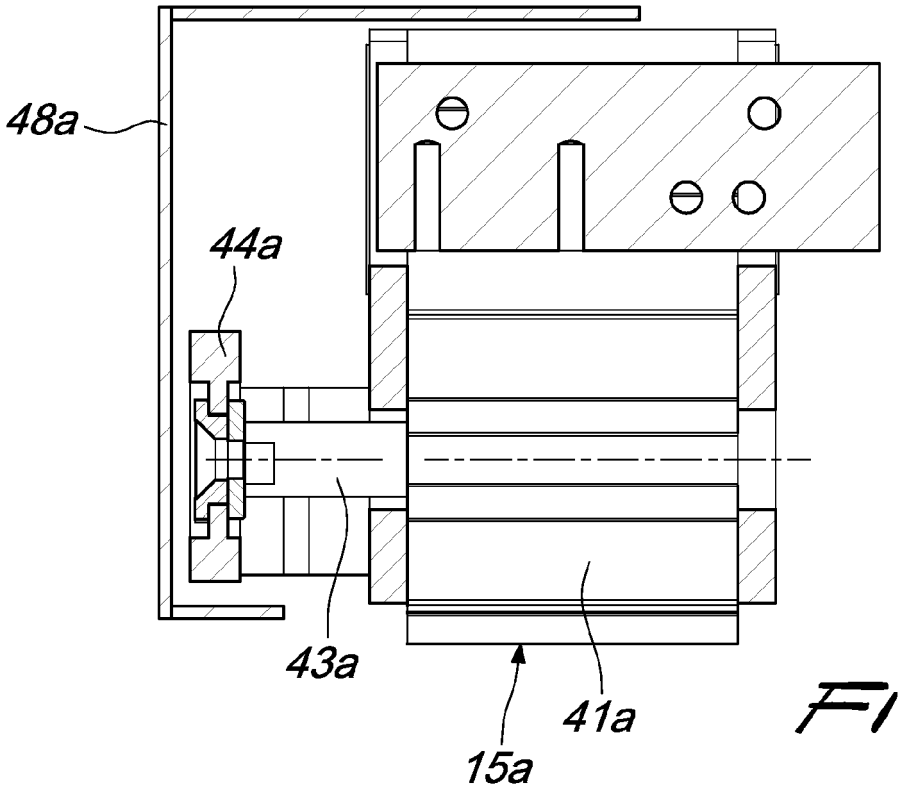

Fig. 12

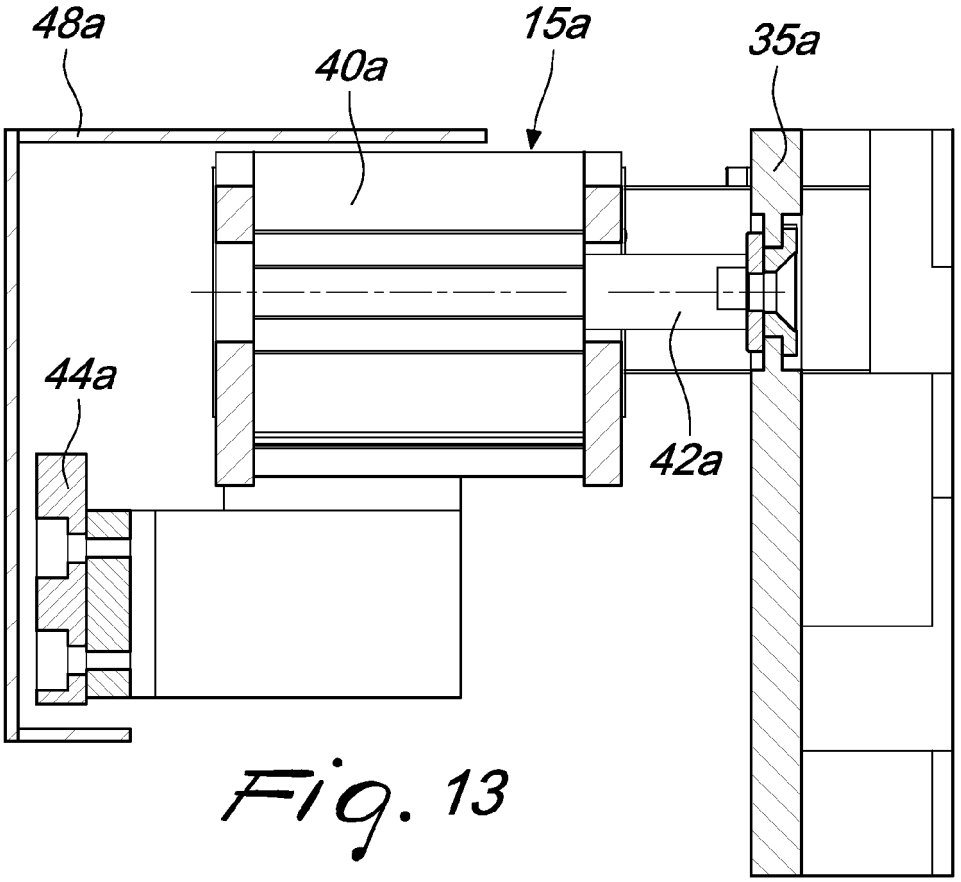

Fig. 13

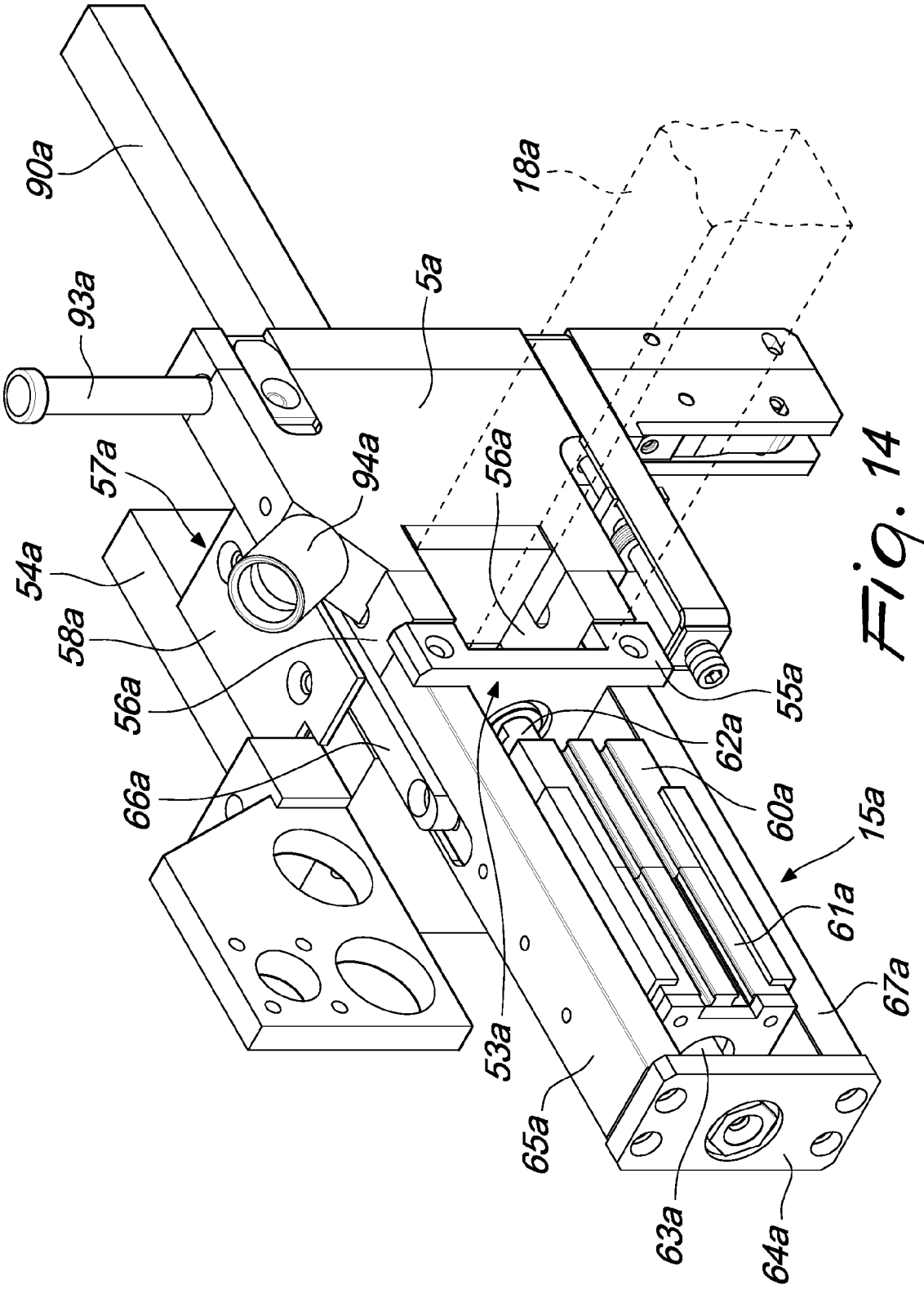
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Fig. 14

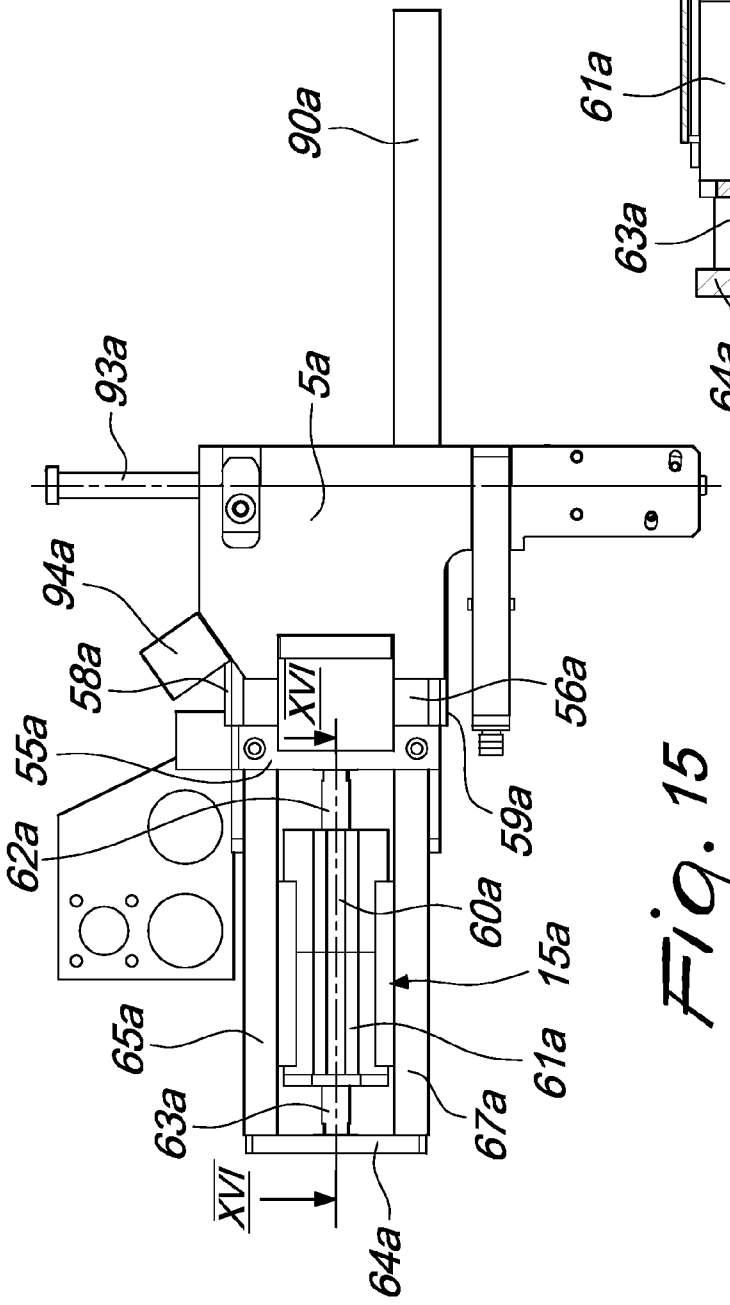
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Fig. 15

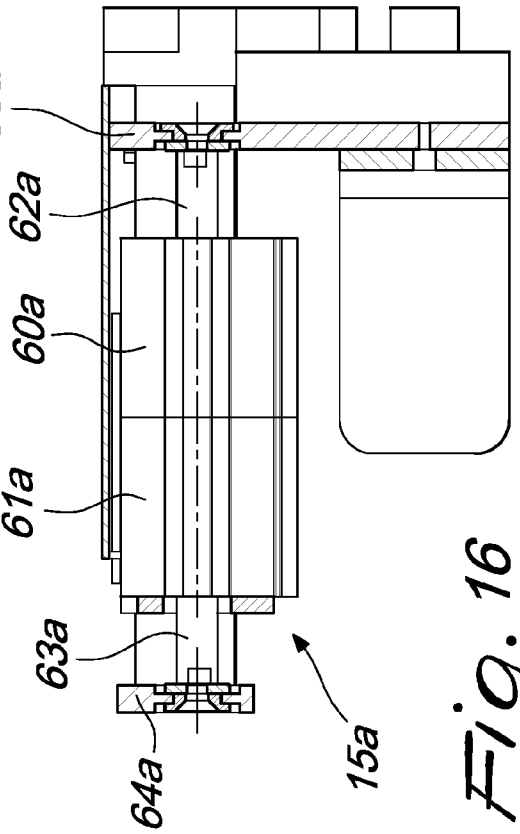
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Fig. 16

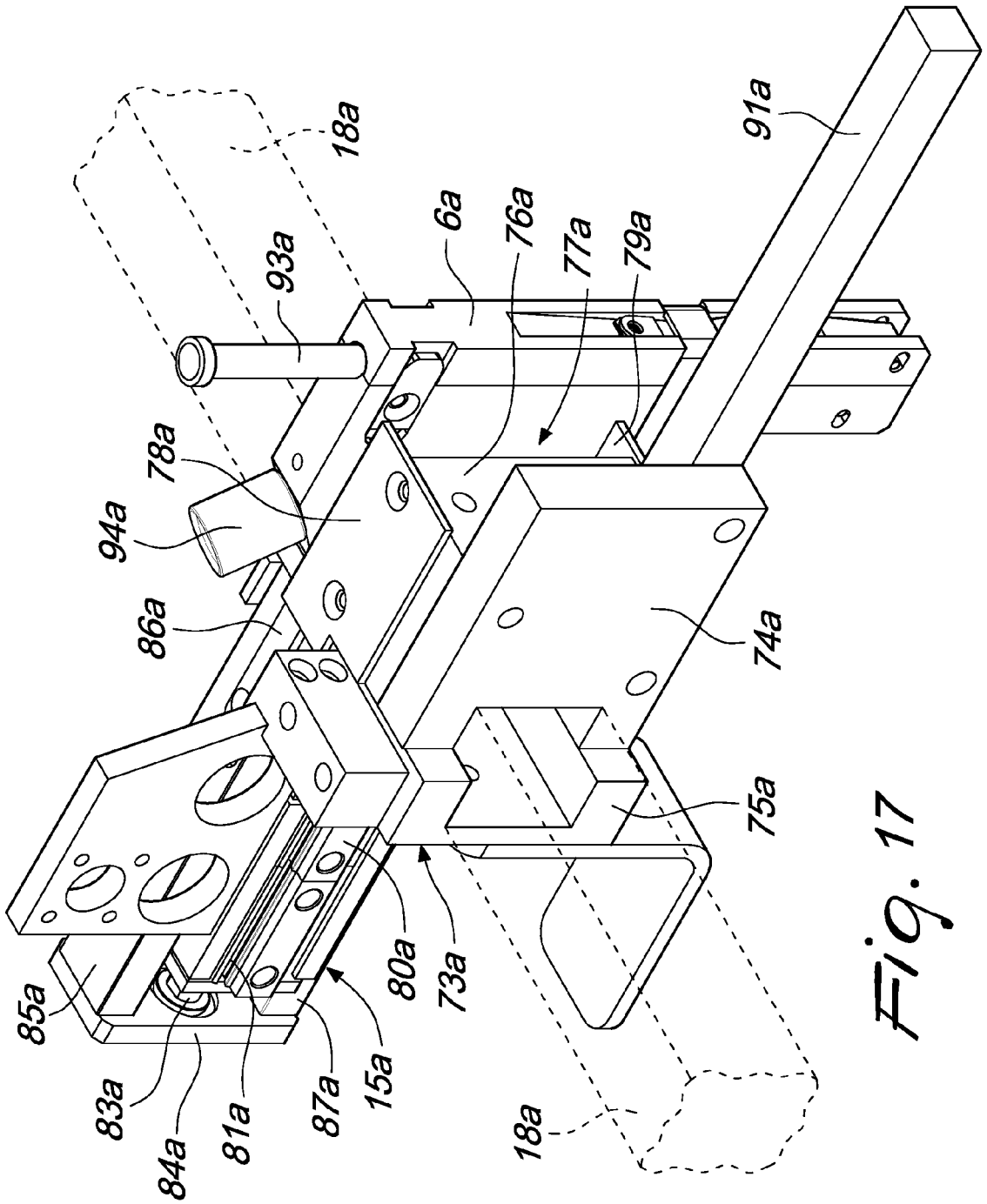
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Fig. 17

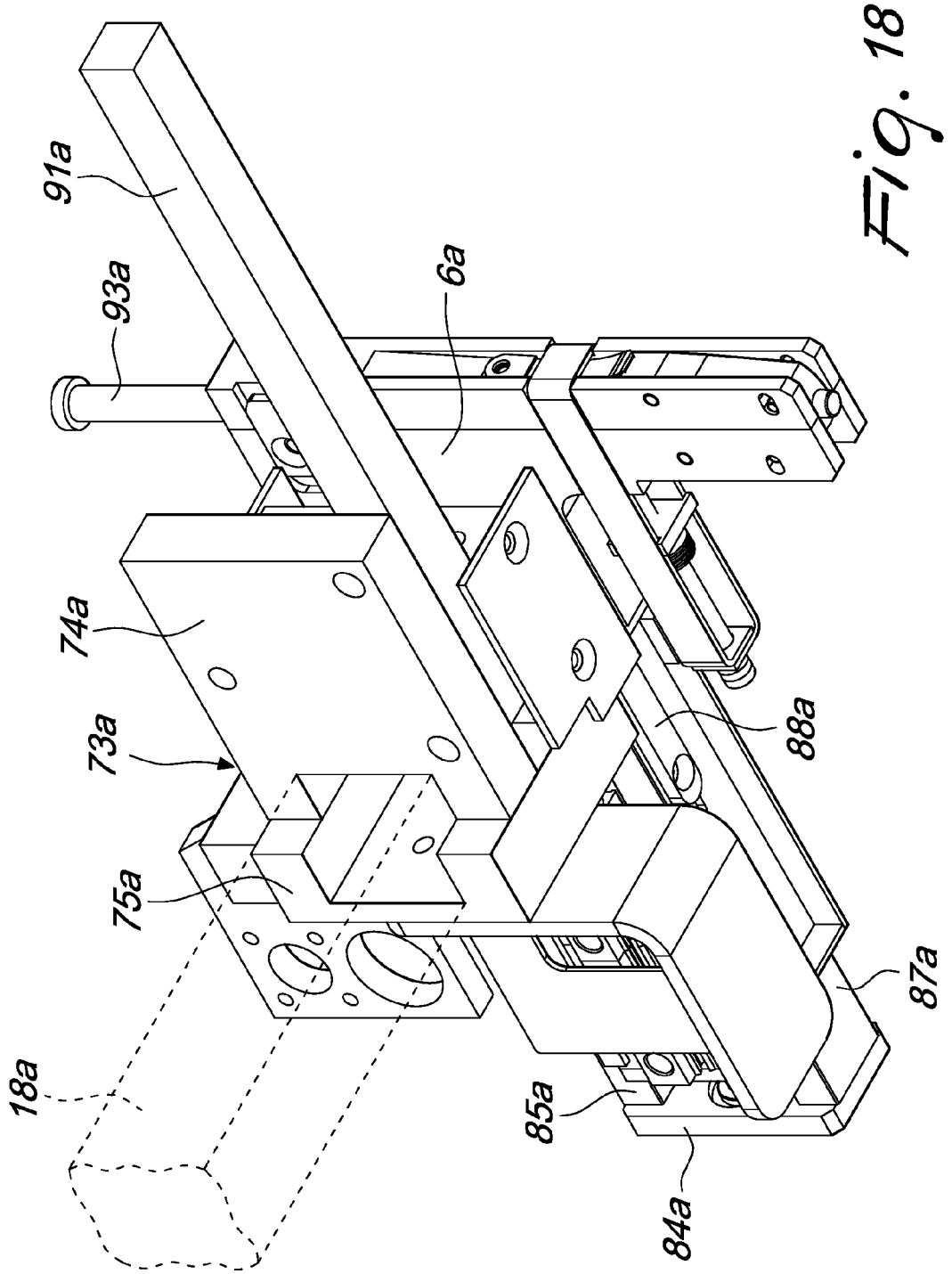

Fig. 18

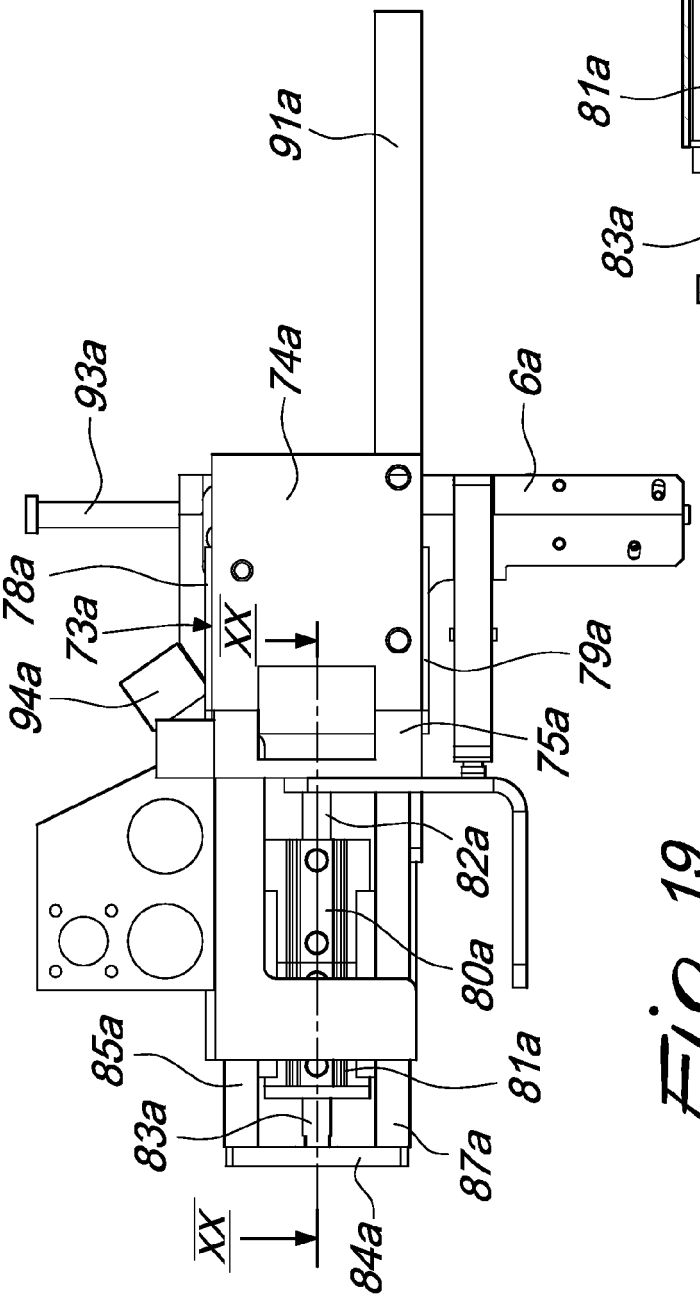
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Fig. 19

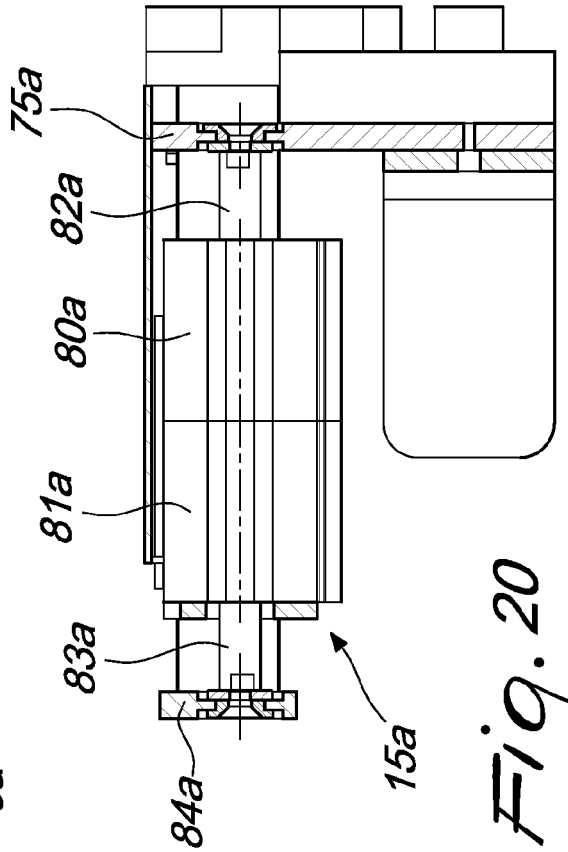
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Fig. 20

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EUROPEAN SEARCH REPORT

Application Number
EP 11 19 1253

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X	CH 651 496 A5 (BOSTITCH AG) 30 September 1985 (1985-09-30) * the whole document * -----	1-11	INV. B27M3/00 B27F7/00
X	EP 0 571 336 A1 (FAGGIONI LUIGI CESARE & SCANDO [IT]) 24 November 1993 (1993-11-24) * the whole document * -----	1	
X	US 5 058 795 A (TONUS EGIDIO L [US]) 22 October 1991 (1991-10-22) * abstract * * figures * * column 5, line 65 - column 6, line 21 * -----	1,2	
X	US 2003/172516 A1 (GLENN JOSEPH K [US]) 18 September 2003 (2003-09-18) * figure 39 * -----	1,2	
A	US 4 204 624 A (BARKER JOSEPH [GB] ET AL) 27 May 1980 (1980-05-27) * abstract * * figure 7 * * column 5, line 49 - column 5, line 54 * -----	5	

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B27M
B27F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	17 January 2012	Hamel, Pascal

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