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(54) **Nailing machine for assembling pallets made of wood or the like, with high flexibility of use**

(57) A nailing machine for assembling pallets made of wood or the like, with high flexibility of use, comprising a nailing station (2) and advancement and guiding means (3) which define a substantially horizontal resting surface (10) at the nailing station (2) for blocks (4) and for an overlying lid (5) to be assembled to the blocks (4) by nailing in order to provide a pallet (11), in the nailing station (2), above the resting surface (10), nailing clamps (8) being provided which are mounted on a supporting element (9) that can move along a substantially vertical direction with respect to the resting surface (10), the nailing clamps (8) can be fed with the nails to be used for nailing and each one is provided with a nailing piston (12) that protrudes upwardly from the corresponding nailing

clamp (8); above the nailing pistons (12) an actuation element (13) being provided, which can move on command with respect to the nailing clamps (8) along a substantially vertical direction toward the resting surface (10) in order to operate, by means of the nailing pistons (12), on the nails fed into the nailing clamps (8) for their expulsion or in the opposite direction with respect to the resting surface (10) in order to allow the feeding of the nailing clamps (8) with another nail, the machine comprising at least one additional shim (14a, 14b, 15a, 15b, 16a, 16b), which can be interposed on command between the upper end of at least one corresponding nailing piston (12) and the actuation element (13) in order to increase the degree of lowering of the at least one corresponding nailing piston (12).

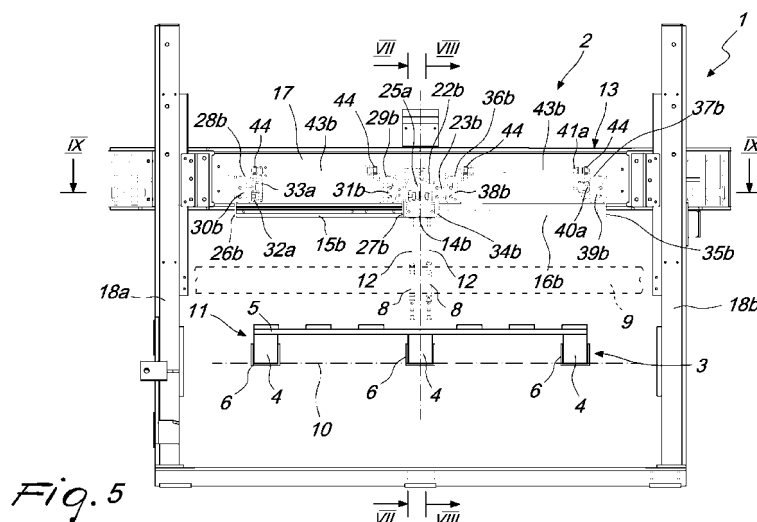


Fig. 5

Description

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

[0002] As is known, pallets made of wood are generally constituted by a loading surface, also known as lid, which is 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 generally composed of three blocks, mutually spaced so that the pallet can be "straddled" by lifting devices on any one of its four sides. Generally, the lid has a rectangular plan shape and the blocks of the three rows are interconnected not only by the lid but also by three stringers, which are arranged parallel to the longer sides of the lid and are nailed to the lower face of the blocks.

[0003] Wood pallets are assembled on nailing machines, which are fed with the lid, which was preassembled on another machine, and with the three rows of blocks.

[0004] These machines are provided with guides for the blocks, which are moved forward along these guides, and with a supporting surface along which the lids are made to advance, generally oriented with their longer sides parallel to the advancement direction. In each instance, a lid and a group of nine blocks, i.e., of three rows of blocks, are arranged at a nailing station, in which nailing heads are arranged which can be actuated so as to nail the lid to the group of underlying blocks.

[0005] Each nailing head comprises a nailing clamp, which is provided with a passage, in which a nail is inserted cyclically, and which retains the nail to be driven. Each nailing clamp is provided with a nailing piston, which protrudes upwardly from the corresponding nailing clamp and enters said passage with its lower end. The nailing clamps are mounted on a supporting element, which can move along a vertical direction in order to cause the resting of the nailing clamps on the region of the pallet lid that in each instance is placed 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.

[0006] Above the nailing pistons an actuation element is provided, which is constituted generally 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 to drive the nails into the lid and into the blocks, nailing them to each other, or upwardly, 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 subsequent nailing process.

[0007] When the upper layer of the lid is composed of

an even number of stringers, the central row of blocks is not located at any stringer of the upper layer, but the blocks of this row are nailed only to three stringers that belong to the lower layer of the lid.

[0008] For this reason, if the lid is fed to the nailing station with the stringers of the upper layer oriented parallel to the advancement direction of the lid and of the blocks, since the nailing clamps are arranged along one or more rows oriented transversely to said advancement direction, one of these nailing clamps will have to operate at a lower level than the others.

[0009] If instead the lid is fed to the nailing station with the stringers of the upper layer oriented at right angles to the advancement direction of the lid and of the blocks, a whole row of nailing clamps will have to operate at a lower level than the one at which it must operate during the nailing of the other two rows of blocks.

[0010] Because of the fact that the descent of the supporting element is generally limited at the bottom by the resting on the lid, for the clamp or clamps that must operate at a lower level there is the problem of being able to push the nails dispensed by that clamp or clamps until they abut against the stringers of the lower layer to which the blocks of the central row must be applied.

[0011] For solving this problem, in machines that operate by causing the advancement of the stringers of the upper layer of the lids parallel to the advancement direction, longer nailing pistons are used for the nailing clamps that are arranged centrally and are therefore designed to operate always at a lower level than the other nailing clamps.

[0012] However, this solution suffers the drawback of requiring manual replacement of the nailing pistons each time one switches from the manufacture of pallets with an even number of stringers in the upper layer of the lid to the manufacture of pallets with an odd number of stringers in the upper layer of the lid.

[0013] Moreover, this solution cannot be used in machines in which the lids are fed to the nailing station with the stringers of the upper layer oriented transversely to the advancement direction.

[0014] The aim of the present invention is to provide a nailing machine for assembling pallets made of wood or the like that can operate on nailing planes arranged at different height levels, without requiring interventions for replacing its components and therefore substantially without requiring machine downtimes.

[0015] Within this aim, an object of the invention is to provide a machine in which it is possible to vary the height level at which the nailing clamps operate in a completely automated manner according to the type of pallet to be assembled.

[0016] Another object of the invention is to provide a machine that is high-precision and reliable in operation.

[0017] 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 and advancement

and guiding means which define a substantially horizontal resting surface at said nailing station for blocks and for an overlying lid to be assembled to the blocks by nailing in order to provide a pallet; in said nailing station, above said resting surface, nailing clamps being provided which are mounted on a supporting element that can move along a substantially vertical direction with respect to said resting surface; said nailing clamps being feedable with the nails to be used for nailing and each clamp being provided with a nailing piston that protrudes upwardly from the corresponding nailing clamp; above the nailing pistons of the several nailing clamps an actuation element being provided that can move on command with respect to said nailing clamps along a substantially vertical direction toward said resting surface in order to operate, by means of said nailing pistons, on the nails fed into said nailing clamps for their expulsion or in the opposite direction with respect to said resting surface in order to allow the feeding of the nailing clamps with another nail, characterized in that it comprises at least one additional shim, which can move on command from an inactive position, in which it is arranged outside the engagement region of the upper end of at least one corresponding nailing piston with said actuation element, to an active position, in which it is interposed between the upper end of said at least one corresponding nailing piston and said actuation element in order to increase the extent of the lowering of said at least one corresponding nailing piston, and vice versa.

[0018] 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 non-limiting 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 greater clarity;

Figure 2 is an enlarged-scale view of a detail of Figure 1;

Figure 3 is a schematic perspective view of the machine according to the invention, with some components omitted and taken from a different angle with respect to Figure 1;

Figure 4 is an enlarged-scale view of a detail of Figure 3;

Figure 5 is a schematic rear elevation view of the machine according to the invention, with some components omitted for the sake of greater clarity;

Figure 6 is an enlarged-scale view of a detail of Figure 5;

Figure 7 is a sectional view of Figure 5, taken along the line VII-VII;

Figure 8 is a sectional view of Figure 5, taken along the line VIII-VIII;

Figure 9 is a sectional view of Figure 5, taken along the line IX-IX, in a different condition of operation

with respect to Figures 7 and 8;

Figure 10 is an enlarged-scale view of a detail of Figure 9;

Figure 11 is a perspective view of two additional shims;

Figure 12 is a perspective view of another additional shim.

[0019] With reference to the figures, the nailing machine according to the invention, generally designated by the reference numeral 1, comprises a nailing station 2 and advancement and guiding means 3 that define a substantially horizontal resting surface 10 at the nailing station 2 for blocks 4 and for a lid 5 that is arranged above the blocks 4.

[0020] More particularly, the advancement and guiding means 3, illustrated schematically in Figure 5, can be constituted, in a manner known per se, by channels 6 which are open upwardly and extend along an advancement direction, designated by the arrow 7, and in which the blocks 4 are made to advance for example by means of chain conveyors provided with traction elements that push the blocks 4.

[0021] The lids 5 are instead fed by means of a conveyor, of a known type and not illustrated for the sake of simplicity, which is raised with respect to the channels 6 so as to arrange, in each instance, a lid 5 above the group of blocks 4 to which it must be nailed, at the nailing station 2, in order to provide a pallet 11.

[0022] In the nailing station 2, above the resting surface 10, there are nailing clamps 8, which are mounted, in a manner known per se, on a supporting element 9, illustrated only partially and schematically in Figure 5, which can move along a substantially vertical direction with respect to the resting surface 10. For the sake of simplicity, only two nailing clamps 8 are illustrated and only in some figures, but the number of the nailing clamps 8 and their arrangement may vary according to the requirements.

[0023] The supporting element 9 extends horizontally and can move on command along a vertical direction in order to make the nailing clamps 8 abut against the upper face of the lid 5, which is arranged at the nailing station 2, before the nailing operation, and in order to rise subsequently so as to allow the pallet 11 assembled by the nailing station 2 to move away and to allow the access, to the same nailing station 2, of a new pallet 11 to be assembled.

[0024] The nailing clamps 8 can be fed, in a manner known per se, with nails to be used for nailing and each one is provided with a nailing piston 12 that protrudes upwardly from the corresponding nailing clamp 8.

[0025] Above the nailing pistons 12 of the several nailing clamps 8, an actuation element 13 is provided, which can move on command with respect to the nailing clamps 8 along a substantially vertical direction downward, i.e., toward the resting surface 10, in order to operate, by means of the nailing pistons 12, on the nails fed to the

nailing clamps 8 so as to cause their expulsion from the lower end of the nailing clamps 8, driving them into the lid 5 and into the blocks 4 arranged at the nailing station 2, or upward, i.e., in the opposite direction with respect to the resting surface 10, in order to allow, in a manner known per se, the feeding of the nailing clamps 8 with another nail to be used for the subsequent nailing step.

[0026] According to the invention, the machine comprises at least one additional shim 14a, 14b, 15a, 15b, 16a, 16b, which can move on command from an inactive position, in which it is arranged outside the engagement region of the upper end of at least one corresponding nailing piston 12 with the actuation element 13, to an active position, in which it is interposed between the upper end of said at least one corresponding nailing piston 12 and the actuation element 13 in order to increase the extent of the lowering of said at least one corresponding nailing piston 12 with respect to the lowering of the nailing pistons 12 that do not interfere with the additional shim 14a, 14b, 15a, 15b, 16a, 16b, and vice versa.

[0027] The nailing clamps 8 are arranged along at least one row, which is oriented transversely to the advancement direction 7 of the blocks 4 and of the lids 5 along the resting surface 10. Preferably, the nailing clamps 8 are arranged along two mutually parallel rows, which are oriented transversely to the advancement direction 7.

[0028] The actuation element 13 comprises a horizontal beam 17, which is arranged transversely to the advancement direction 7 and faces, with its lower face, the upper end of the nailing pistons 12.

[0029] More precisely, the beam 17 is supported, so that can slide along a vertical direction, by a pair of vertical shoulders 18a, 18b and is actuated, in a manner known per se, for example by fluid-operated or mechanical means, which are not shown for the sake of simplicity. The width of the beam 17 is such as to allow its lower side to overlap the upper ends of the nailing pistons 12, so that a lowering of the beam 17 causes the lowering of the nailing pistons 12 inside the corresponding nailing clamps 8.

[0030] The supporting element 9 can be actuated along a vertical direction autonomously or can be connected, in a manner known per se, to the beam 17 so that the lowering of the beam 17, for a first lowering portion, makes the nailing clamps 8 abut against the lid 5, which is arranged at the nailing station 2, and so that the beam 17 can move further downward with respect to the supporting element 9 in order to actuate the nailing pistons 12.

[0031] Below the beam 17, at a preset distance from its lower face, retention plates 19 are provided, which are arranged on a horizontal plane and are fixed rigidly to the beam 17 by means of profiles 45. The retention plates 19 are provided with holes through which the nailing pistons 12 pass, their upper end being enlarged so as to prevent downward extraction of the nailing pistons 12 with respect to the holding plates 19. In this manner, when the beam 17 is lifted, after a first lifting portion, it brings

with it the nailing pistons 12 as well.

[0032] Conveniently, for each row of nailing clamps 8 there are a central additional shim 14a, 14b and two lateral additional shims 15a, 16a, 15b, 16b, which are arranged on mutually opposite sides with respect to the central additional shim 14a, 14b. For each row of nailing clamps 8, the corresponding additional shims 14a, 15a, 16a and 14b, 15b, 16b are mutually laterally adjacent along a direction that is substantially perpendicular to the advancement direction 7 and each additional shim can move individually with respect to the beam 17 parallel to the advancement direction 7 in order to pass from the inactive position, in which it is laterally offset with respect to the underlying corresponding nailing piston or pistons 12, to the active position, in which it is interposed between the lower face of the beam 17 and the underlying corresponding nailing piston or pistons 12, and vice versa.

[0033] More particularly, in the illustrated embodiment, in which the nailing clamps 8 are arranged along two rows, which are mutually parallel and oriented transversely to the advancement direction 7, for each one of these two rows there is a group of additional shims, each composed of a central additional shim 14a, 14b and two lateral additional shims 15a, 16a and 15b, 16b.

[0034] Preferably, each additional shim 14a, 14b, 15a, 15b, 16a, 16b is supported individually, so that it can slide along a direction that is substantially parallel to the advancement direction 7, by the beam 17, and for each additional shim 14a, 14b, 15a, 15b, 16a, 16b there is a corresponding actuator, which can be actuated to cause the transition of the corresponding additional shim 14a, 14b, 15a, 15b, 16a, 16b from the inactive position to the active position and/or vice versa.

[0035] More particularly, the group of additional shims 14a, 15a, 16a is supported on the front side of the beam 17, while the group of additional shims 14b, 15b, 16b is supported on the rear side of the beam 17.

[0036] With reference to the group of additional shims 14a, 15a, 16a supported on the front side of the beam 17, the central additional shim 14a is constituted by a plate, which is arranged on a horizontal plane and is supported by a pair of arms 20a, 21 a, which extend downwardly from a block 22a that is supported, so that it can slide, by a guide 23a that is fixed to the front side of the beam 17 and extends parallel to the advancement direction 7. The block 22a is connected to the stem of the piston of a fluid-operated cylinder 24a, which is connected by means of its body to an arm 25a which is fixed to the rear side of the beam 17 and passes, with the stem of its piston, through a passage formed appropriately in the beam 17, more precisely in the central wing or core of the beam 17, which in the illustrated embodiment has an I-shaped cross-section.

[0037] Again with reference to the group of additional shims 14a, 15a, 16a supported on the front side of the beam 17, the lateral additional shim 15a is constituted by a plate that is arranged in a horizontal plane and is supported, at its longitudinal ends, by a pair of arms 26a,

27a which extend downwardly from a corresponding block 28a, 29a, which is supported, so that it can slide, along a corresponding guide 30a, 31a that is fixed to the front side of the beam 17 and extends parallel to the advancement direction 7. The block 28a is connected to the stem of the piston of a fluid-operated cylinder 32a, which is connected by means of its body to an arm 33a that is fixed to the rear side of the beam 17 and passes, with the stem of its piston, through a passage formed appropriately in the beam 17. Likewise, the lateral additional shim 16a is constituted by a plate that is arranged on a horizontal plane and is supported, at its longitudinal ends, by a pair of arms 34a, 35a, which extend downwardly from a corresponding block 36a, 37a that is supported, so that it can slide, along a corresponding guide 38a, 39a, which is fixed to the front side of the beam 17 and extends parallel to the advancement direction 7. The block 37a is connected to the stem of the piston of a fluid-operated cylinder 40a, which is connected by means of its body to an arm 41a, which is fixed to the rear side of the beam 17 and passes, with the stem of its piston, through a passage provided appropriately in the beam 17.

[0038] The additional shims that belong to the group supported on the rear side of the beam 17 are supported and actuated with elements similar to the ones described with reference to the ones supported on the front side of the beam 17. The elements for supporting and actuating the additional shims that are supported on the rear side of the beam 17 that correspond to the ones that have already been described have been designated, if visible, by the same reference numbers but with the letter "b" instead of the letter "a".

[0039] In Figures 3 and 4, the additional shims 14a, 16a, 15b are in the inactive position, while the additional shims 15a, 14b, 16b are in the active position. In Figures 7 and 9, the central additional shims 14a, 14b are in the active position. In Figures 9 and 10, all the additional shims 14a, 14b, 15a, 15b, 16a, 16b are in the inactive position.

[0040] Advantageously, each lateral additional shim 15a, 15b, 16a, 16b is fixed, proximate to each one of its longitudinal ends, to a rack 42, which runs parallel to the advancement direction 7, and on the front side and on the rear side of the beam 17 there is a connecting shaft 43a, 43b, which is supported, so that it can rotate about its own axis, by the beam 17 and is oriented at right angles to the advancement direction 7. Pinions 44 are keyed on this connecting shaft 43a, 43b and mesh with the racks 42, mutually connecting the two lateral additional shims 15a, 16a and 15b, 16b supported on the same side of the beam 17 and rendering uniform their motion along the corresponding sliding guides, which is caused by the actuation of the fluid-operated cylinders 32a, 40a, 32b, 40b.

[0041] In practice, the connecting shaft 43a interconnects the lateral additional shims 15a, 16a supported on the front side of the beam 17, while the connecting shaft

43b interconnects the lateral additional shims 15b, 16b, which are supported on the rear side of the beam 17 in their translation parallel to the advancement direction 7 so as to pass from the inactive position to the active position and vice versa.

[0042] It should be noted that the actuators, which are constituted, in the illustrated embodiment, by the fluid-operated cylinders 24a, 24b, 32a, 32b, 40a, 40b, that cause the transition of the additional shims 14a, 14b, 15a, 15b, 16a, 16b from the inactive position to the active position and vice versa, are conveniently connected to an actuation and control element of the programmable electronic type, which supervises the operation of the machine so that the actuation of the additional shims 14a, 14b, 15a, 15b, 16a, 16b is performed according to preset programs depending on the type of pallet 11 to be assembled. In this manner, the machine according to the invention can pass from the production of one type of pallet to the production of another type of pallet in a completely automated manner.

[0043] Operation of the machine according to the invention is as follows.

[0044] In each instance, while the nailing clamps 8 are raised, a row of three blocks 4 with a lid 5 superimposed thereon is placed in the nailing station 2 below the beam 17.

[0045] When the nailing clamps 8 must operate on the loading surface of the pallet, i.e., on the surface which is defined by the upper face of the lid, the additional shims 14a, 14b, 15a, 15b, 16a, 16b are kept in the inactive position. In this manner, when the beam 17 is lowered, it operates directly, with its lower side on the upper end of the nailing pistons 12, causing their lowering into the nailing clamps 8 and therefore driving the corresponding nail into the lid 5 and into the underlying block 4.

[0046] If the nailing clamps 8 that are arranged centrally and/or the nailing clamps 8 that are arranged laterally must work on a surface that is lowered with respect to the surface defined by the upper face of the lid 5, the corresponding additional shims 14a, 14b and/or 15a, 15b, 16a, 16b are brought to the active position, interposing themselves between the lower face of the beam 17 and the upper end of the corresponding nailing pistons 12. In this manner, when the beam 17 is lowered, it operates, with its lower side, on the upper end of the nailing pistons 12 with the interposition of the additional shims 14a, 14b and/or 15a, 15b, 16a, 16b brought to the active position, causing their lowering into the nailing clamps 8 further than what it is obtained when the nailing pistons 12 are pushed directly by the beam 17.

[0047] Due to the fact that the central additional shims 14a, 14b can be actuated independently of the lateral additional shims 15a, 15b, 16a, 16b, it is possible to work both with lids 5 fed with the stringers of the upper layer oriented parallel to the advancement direction 7 and with lids 5 fed with the stringers of the upper layer oriented at right angles to the advancement direction 7.

[0048] In the first case, in fact, if the lid 5 has an even

number of stringers in the upper layer the nailing clamp 8, or the nailing clamps 8 that are arranged centrally, operate always at a lower level than the other nailing clamps 8. In this first case, the central additional shim 14a or 14b or the central additional shims 14a, 14b are brought to the active position, while the lateral additional shims 15a, 15b, 16a, 16b are kept in the inactive position.

[0049] In the second case, if the lid 5 has an even number of stringers in the upper layer, all the nailing clamps 8 that belong to one row must operate sometimes at a level that corresponds to the loading surface of the pallet 11 and sometimes at a lower level. In this case, the additional shims 14a, 14b, 15a, 15b, 16a, 16b that correspond to the nailing clamps 8 that are arranged along a same row, are brought to the active position when said clamps must operate at a lower level.

[0050] In practice it has been found that the machine according to the invention fully achieves the intended aim, since it is capable of operating on nailing surfaces arranged at different levels without requiring interventions for replacing its components and therefore substantially without requiring machine downtimes.

[0051] 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.

[0052] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0053] The disclosures in Italian Patent Application No. MI2010A001768 from which this application claims priority are incorporated herein by reference.

[0054] 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 made of wood or the like, comprising a nailing station (2) and advancement and guiding means (3) which define a substantially horizontal resting surface (10) at said nailing station (2) for blocks (4) and for an overlying lid (5) to be assembled to the blocks (4) by nailing in order to provide a pallet (11); in said nailing station (2), above said resting surface (10), nailing clamps (8) being provided which are mounted on a supporting element (9) that can move along a substantially vertical direction with respect to said resting surface (10); said nailing clamps (8) being feedable with the nails to be used for nailing and each one being provided with a nailing piston (12) that protrudes up-

wardly from the corresponding nailing clamp (8); above the nailing pistons (12) of the various nailing clamps (8) an actuation element (13) being provided that can move on command with respect to said nailing clamps (8) along a substantially vertical direction toward said resting surface (10) in order to operate, by means of said nailing pistons (12), on the nails fed into said nailing clamps (8) for their expulsion or in the opposite direction with respect to said resting plane (10) in order to allow the feeding of the nailing clamps (8) with another nail, **characterized in that** it comprises at least one additional shim (14a, 14b, 15a, 15b, 16a, 16b), which can move on command from an inactive position, in which it is arranged outside the engagement region of the upper end of at least one corresponding nailing piston (12) with said actuation element (13), to an active position, in which it is interposed between the upper end of said at least one corresponding nailing piston (12) and said actuation element (13) in order to increase the degree of lowering of said at least one corresponding nailing piston (12), and vice versa.

2. The machine according to claim 1, **characterized in that** said nailing clamps (8) are arranged along at least one row which is oriented transversely to the advancement direction (7) of the blocks (4) and of the lids (5) along said resting surface (10), said actuation element (13) comprising a horizontal beam (17) which is arranged transversely to said advancement direction (7) and faces, with its lower face, the upper end of said nailing pistons (12).
3. The machine according to claims 1 and 2, **characterized in that** said at least one additional shim (14a, 14b, 15a, 15b, 16a, 16b) comprises a central additional shim (14a, 14b) and two lateral additional shims (15a, 15b, 16a, 16b), which are arranged on mutually opposite sides with respect to said central additional shim (14a, 14b), said additional shims (14a, 14b, 15a, 15b, 16a, 16b) being mutually laterally adjacent along a direction that is substantially perpendicular to said advancement direction (7) and being movable individually with respect to said beam (17) parallel to said advancement direction (7) in order to pass from said inactive position, in which they are laterally offset with respect to said at least one corresponding nailing piston (12), to said active position, in which they are interposed between the lower face of said beam (17) and the upper end of said at least one corresponding nailing piston (12), and vice versa.
4. The machine according to one or more of the preceding claims, **characterized in that** said nailing clamps (8) are arranged along two mutually parallel rows which are oriented transversely to said advancement direction (7), for each one of said two

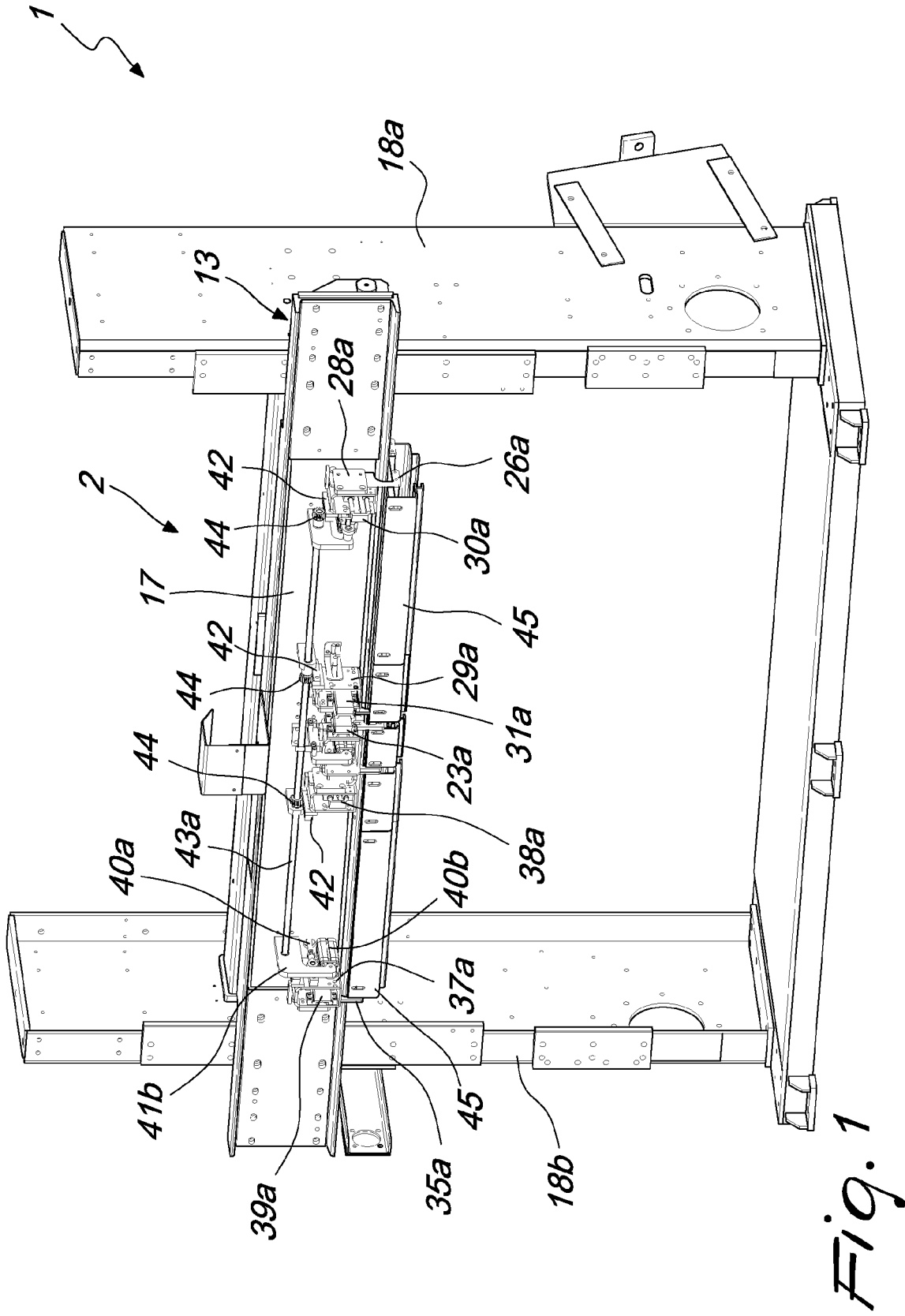
rows a central additional shim (14a, 14b) and two lateral additional shims (15a, 16a, 15b, 16b) being provided which are arranged on mutually opposite sides with respect to said additional central shim (14a, 14b) and are mutually laterally adjacent along a direction that is substantially perpendicular to said advancement direction (7). 5

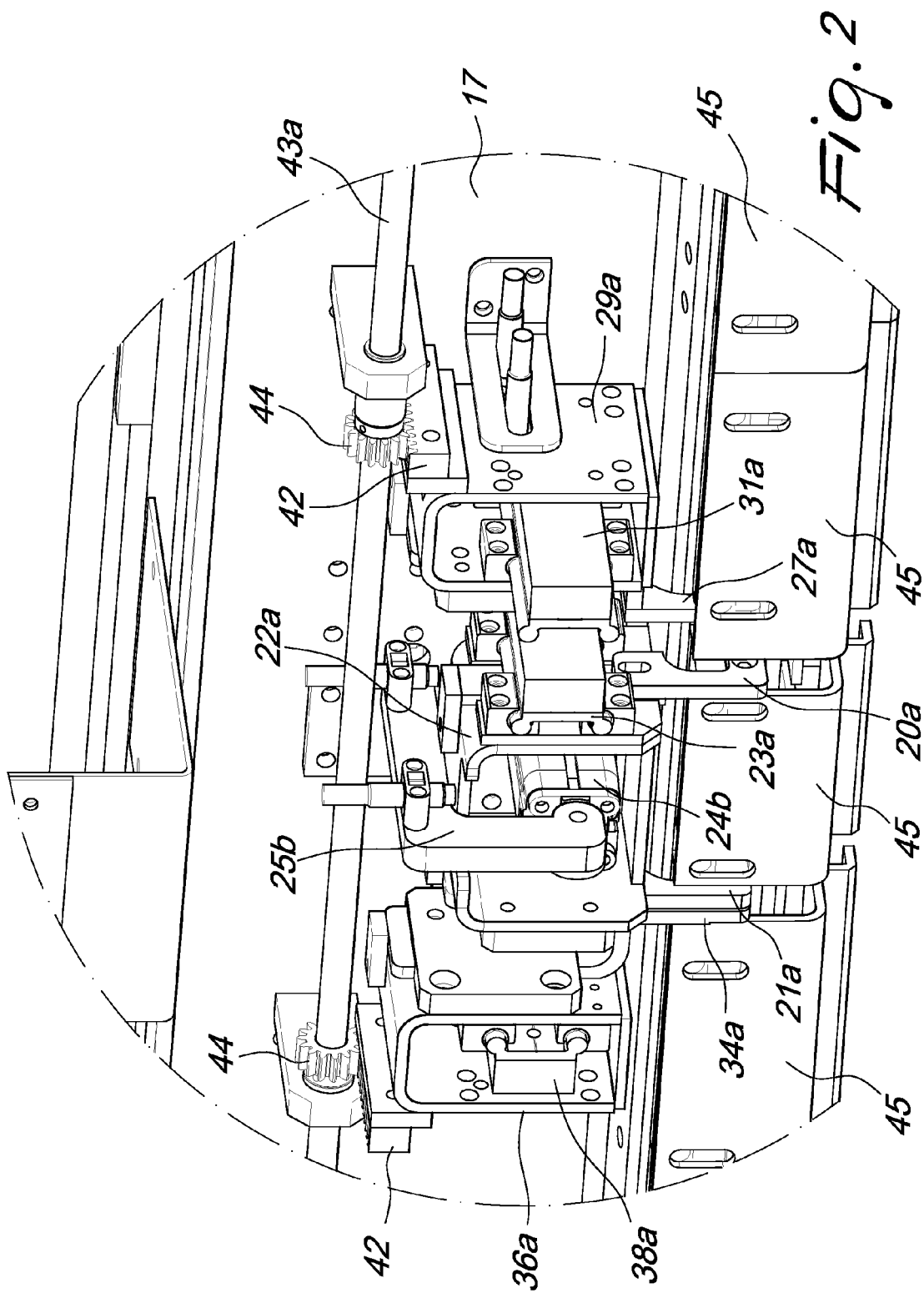
5. The machine according to one or more of the preceding claims, **characterized in that** said additional shims (14a, 14b, 15a, 15b, 16a, 16b) are supported individually, so that they can slide along a direction that is substantially parallel to said advancement direction (7), by said beam (17); for each one of said additional shims (14a, 14b, 15a, 15b, 16a, 16b) a corresponding actuator (24a, 24b, 32a, 32b, 40a, 40b) being provided, which can be actuated to cause the transition of the corresponding additional shim (14a, 14b, 15a, 15b, 16a, 16b) from said inactive position to said active position and/or vice versa. 10 15 20

6. The machine according to one or more of the preceding claims, **characterized in that** said actuator is constituted by a fluid-operated cylinder (24a, 24b, 32a, 32b, 40a, 40b), which is connected, by means of its body, to said beam (17) and which is connected, by means of the stem of its piston, to the corresponding additional shim (14a, 14b, 15a, 15b, 16a, 16b) to be actuated. 25 30

7. The machine according to one or more of the preceding claims, **characterized in that** each one of said lateral additional shims (15a, 15b, 16a, 16b) is supported, proximate to its longitudinal ends, by sliding guides (30a, 31a, 30b, 31b, 38a, 39a, 38b, 39b), which are oriented parallel to said advancement direction (7) and is fixed, proximate to each one of its longitudinal ends, to a rack (42) which runs parallel to said advancement direction (7); a connecting shaft (43a, 43b) being provided which is oriented substantially at right angles to said advancement direction (7) and is supported so that it can rotate about its own axis by said beam (17), pinions (44) being keyed on said connecting shaft (43a, 43b), each pinion meshing with one of said racks (42). 35 40 45

8. The machine according to one or more of the preceding claims, **characterized in that** said actuators (24a, 24b, 32a, 32b, 40a, 40b) are connected to an actuation and control element of the programmable electronic type, which is adapted to control said actuators (24a, 24b, 32a, 32b, 40a, 40b) according to programs that are preset as a function of the type of pallet (11) to be assembled. 50 55





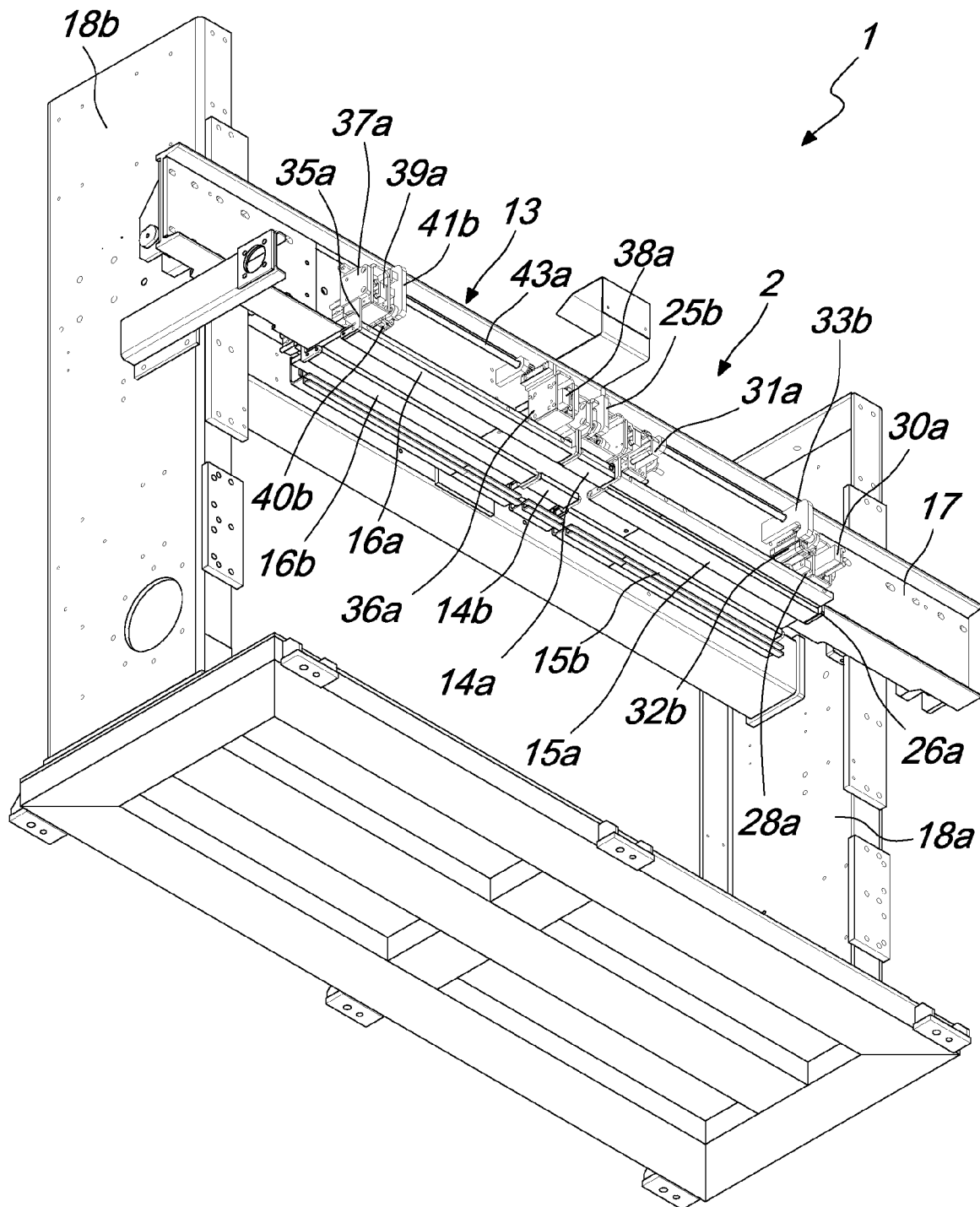
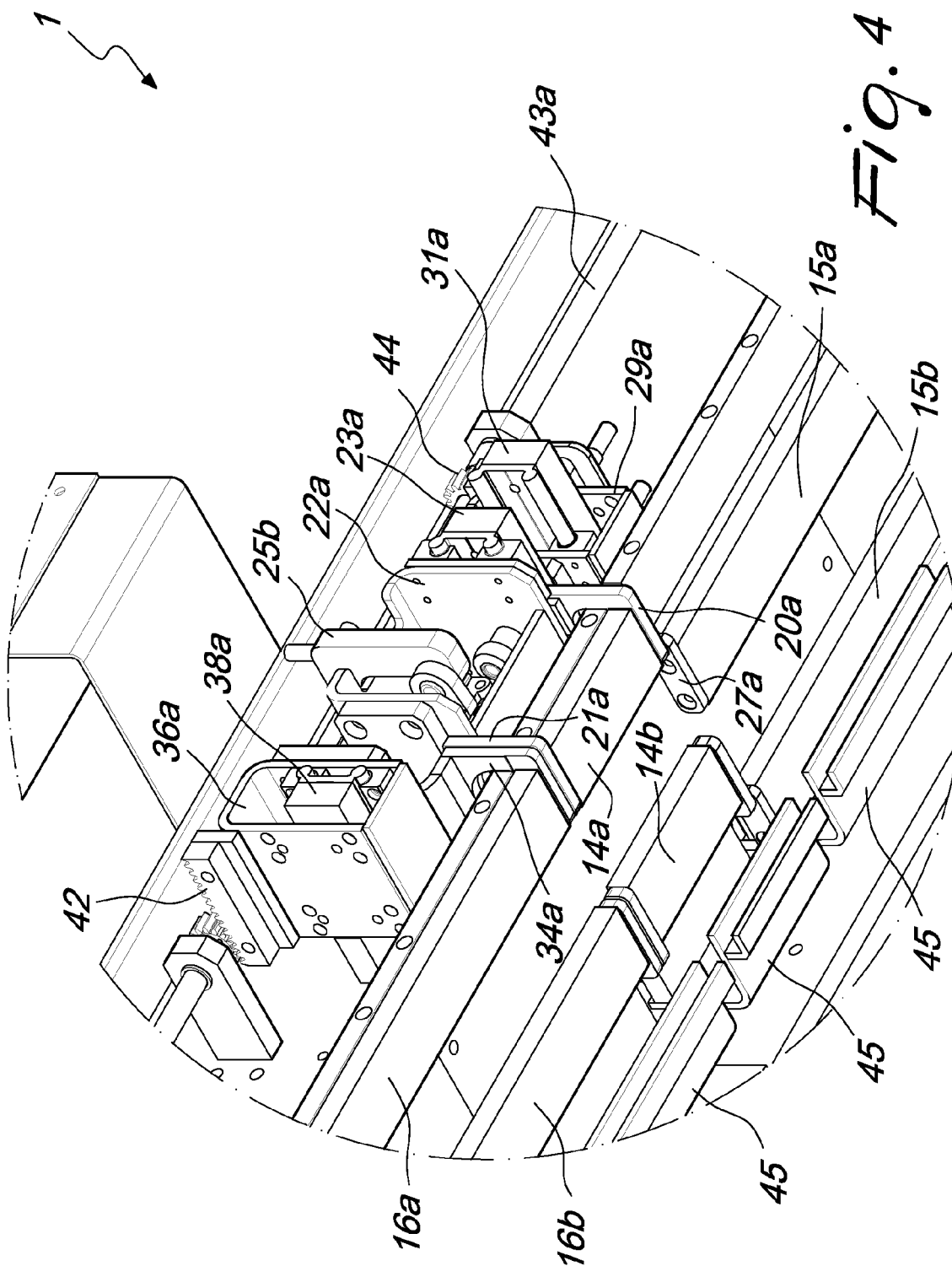
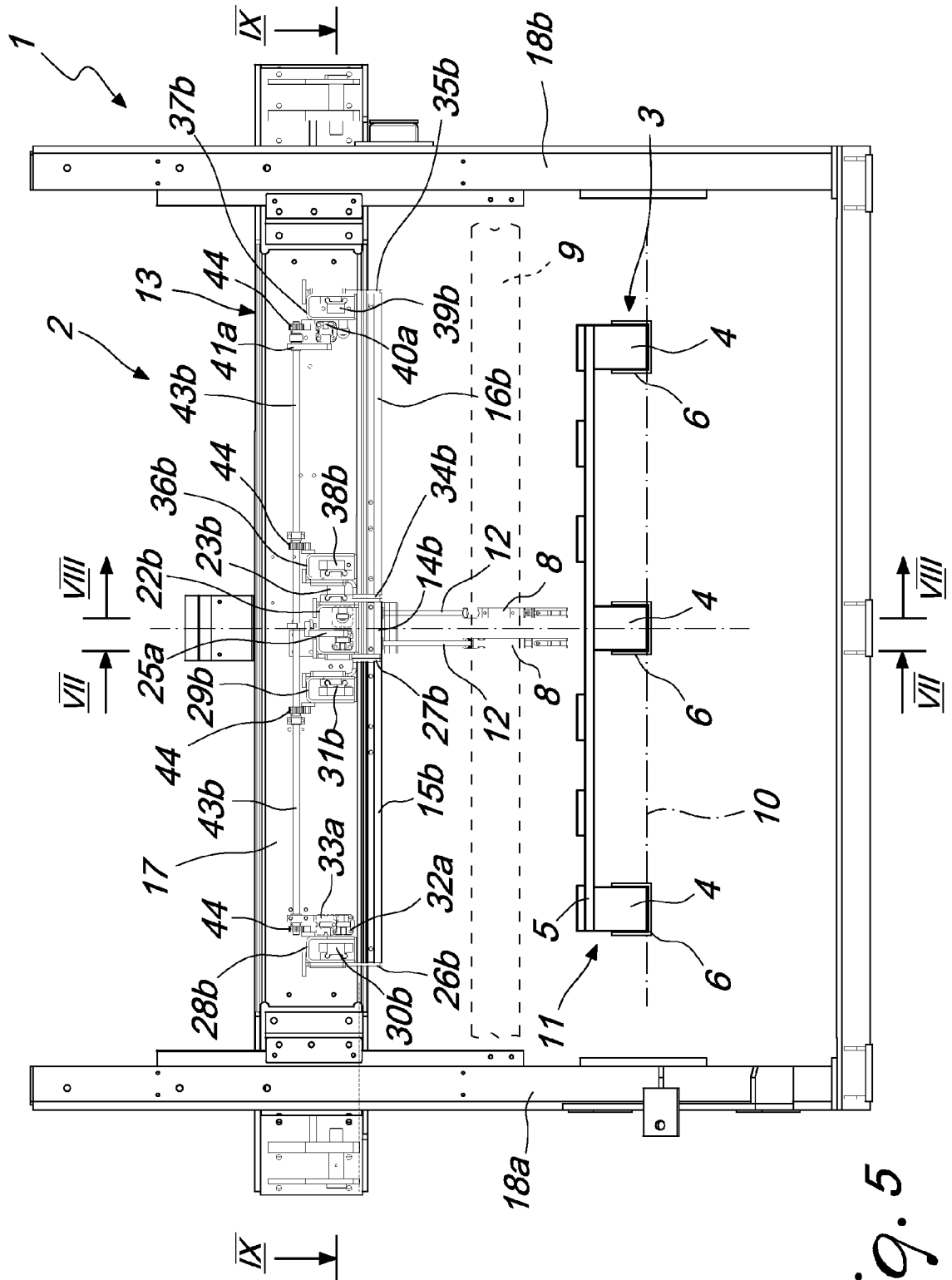


Fig. 3





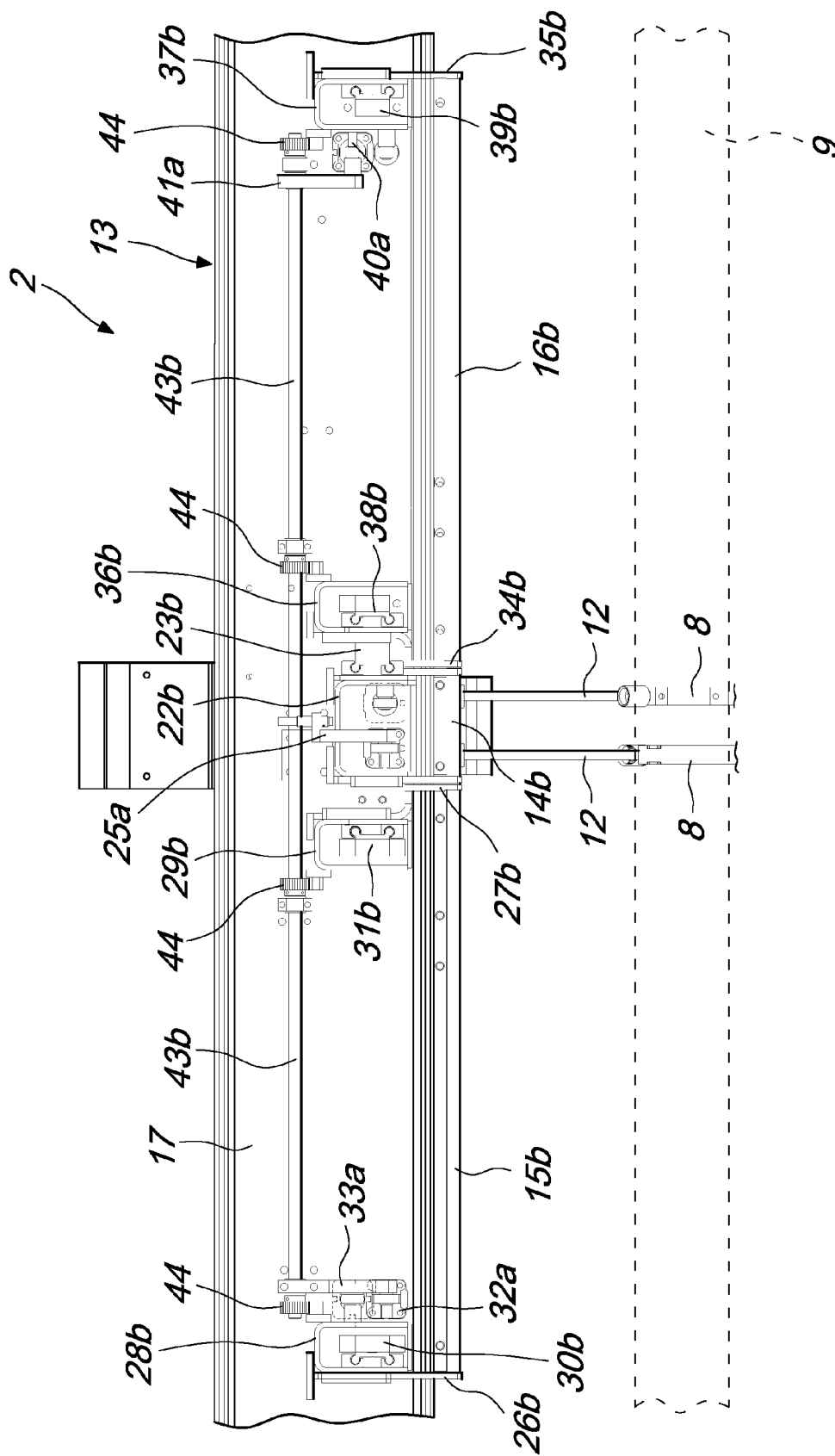


Fig. 6

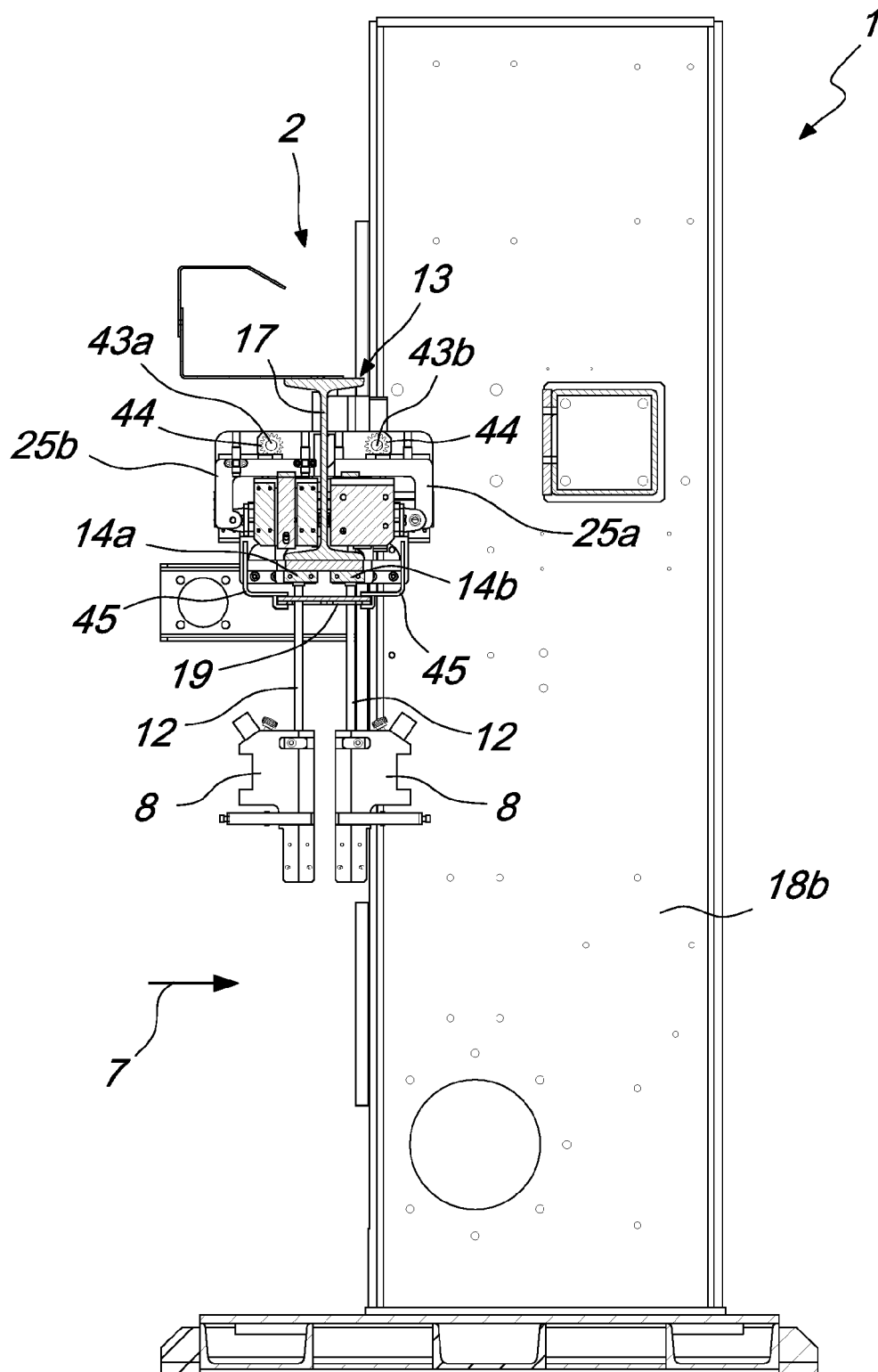


Fig. 7

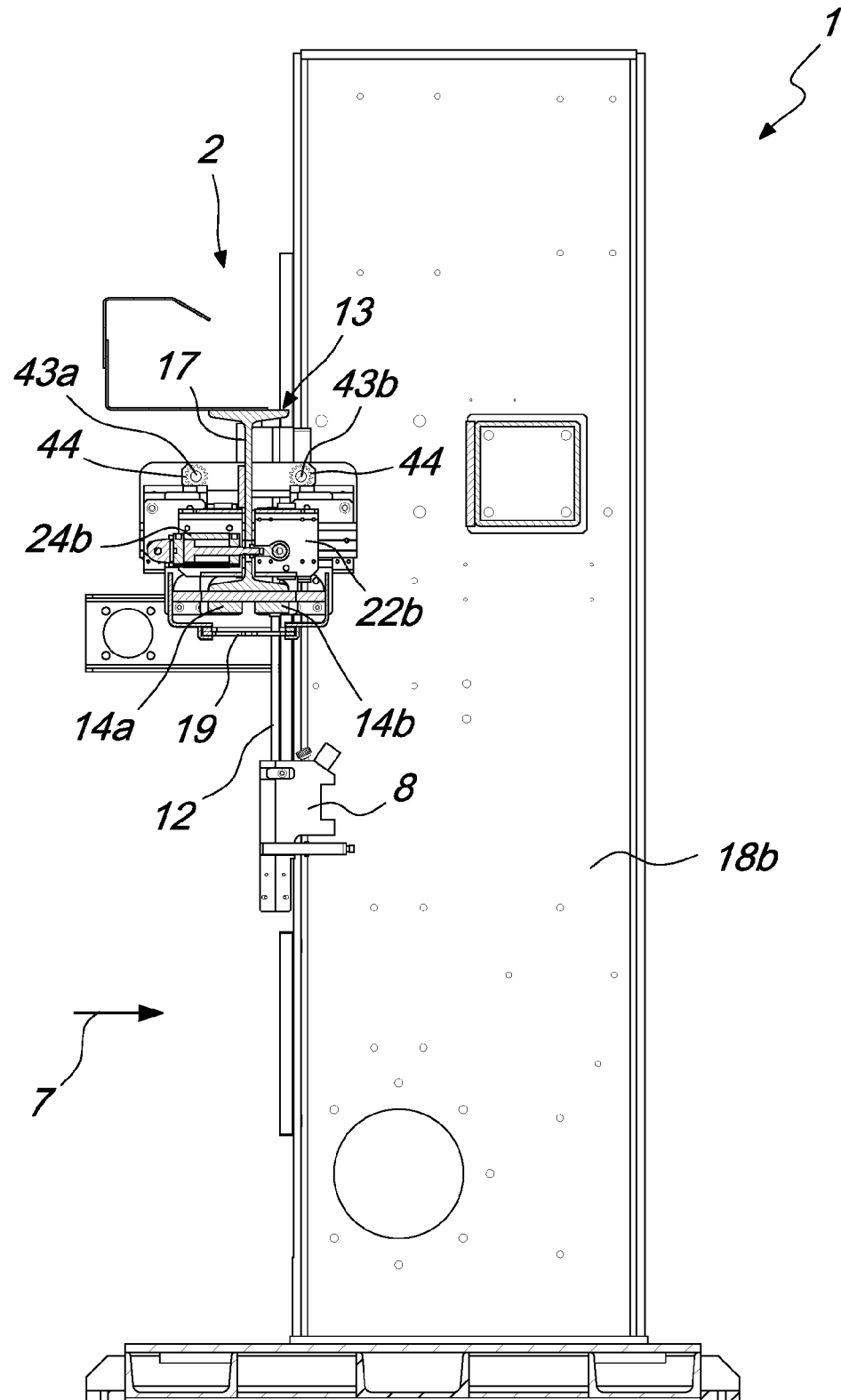


Fig. 8

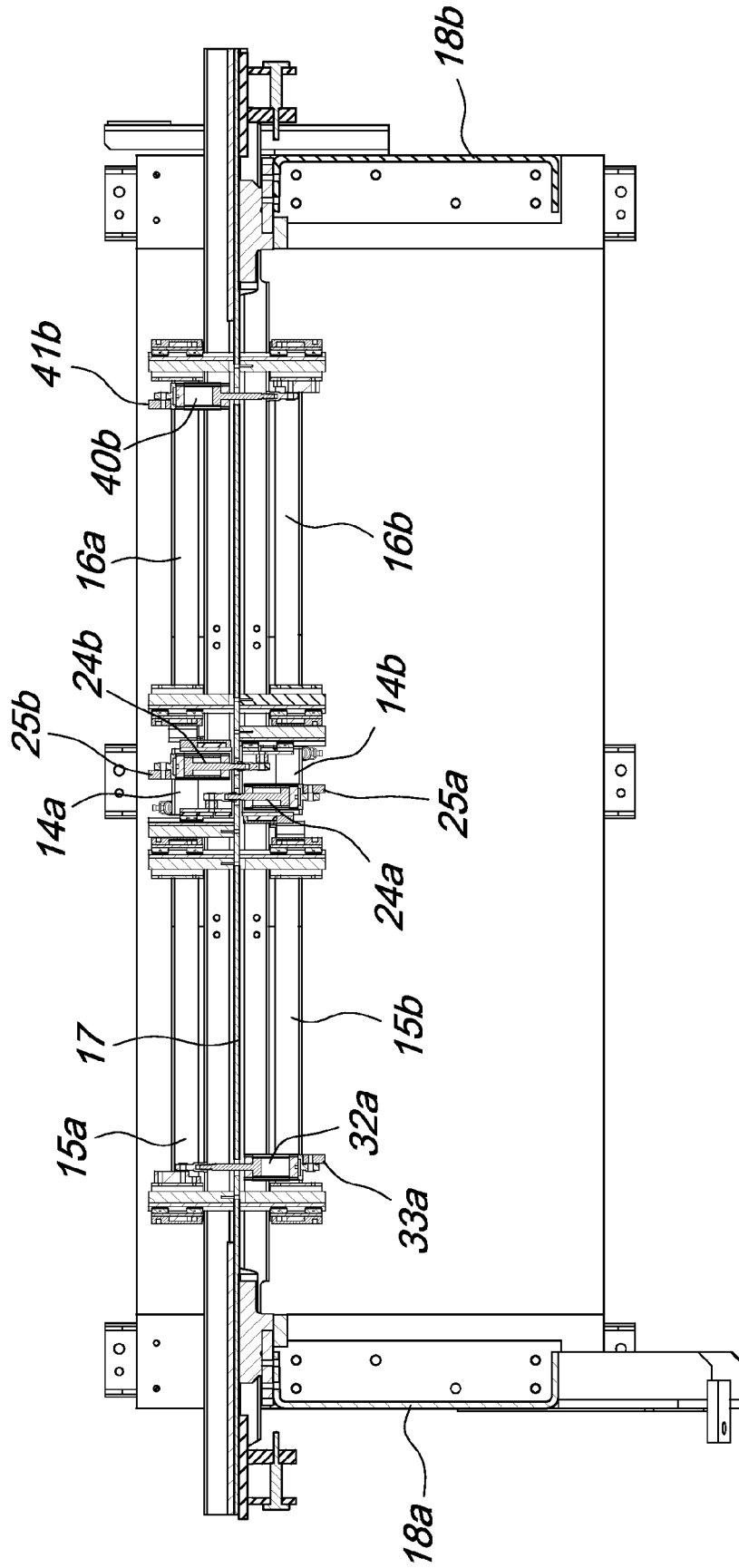
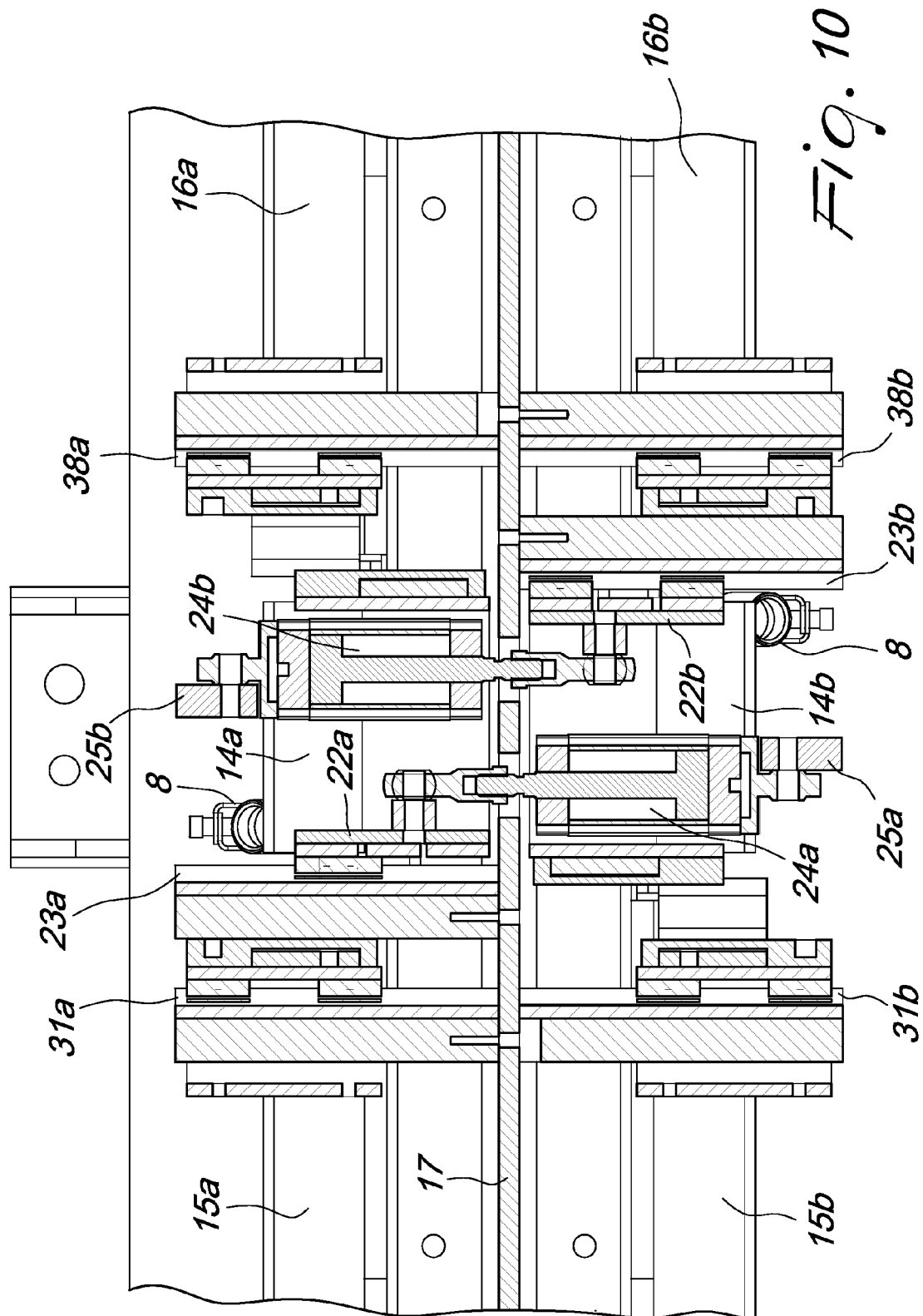


Fig. 9



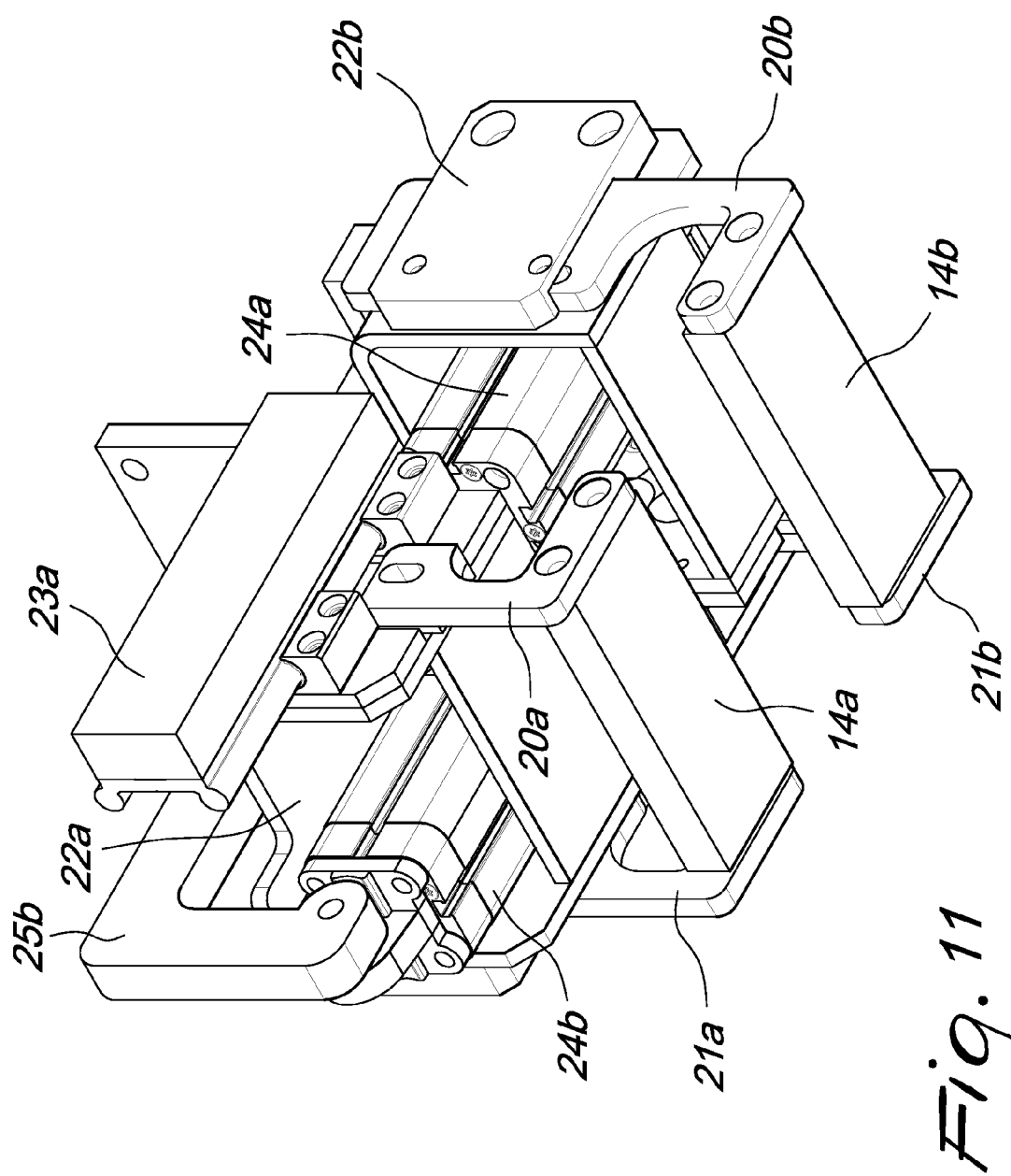
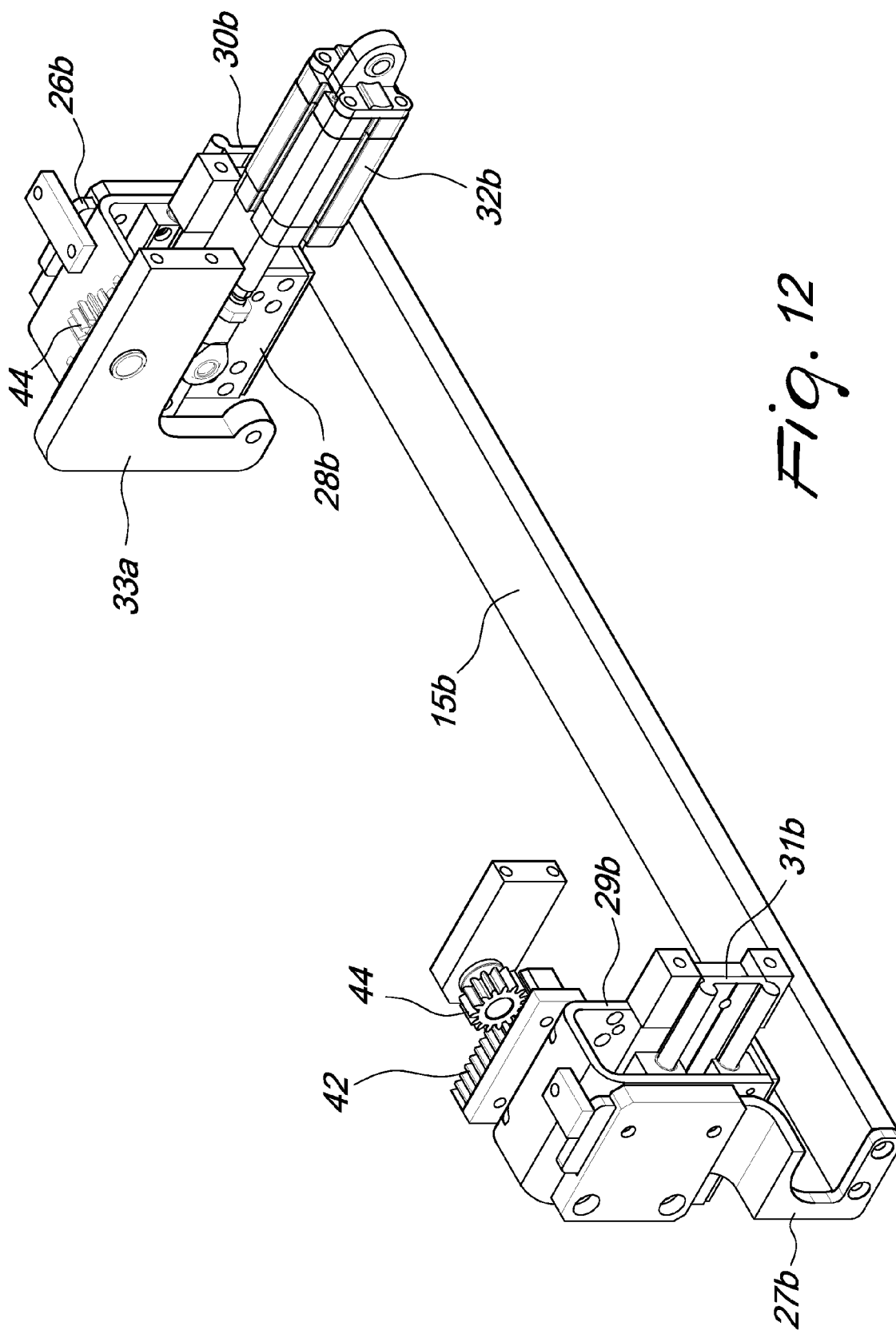


Fig. 11





EUROPEAN SEARCH REPORT

Application Number
EP 11 18 0691

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 489 819 A (PERRIN LLOYD E [US] ET AL) 25 December 1984 (1984-12-25) * abstract * * figures * * column 2, line 28 - column 2, line 39 * * column 8, line 4 - column 8, line 32 * -----	1,2	INV. B27M3/00
A	US 3 207 403 A (STODDARD CLARENCE F ET AL) 21 September 1965 (1965-09-21) * the whole document * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B27M
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 January 2012	Examiner Hamel, Pascal
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 18 0691

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The members are as contained in the European Patent Office EDP file on
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18-01-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 3207403 A	21-09-1965	NONE	

REFERENCES CITED IN THE DESCRIPTION

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