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(72) Inventors:
• **Trovenzi, Giuseppe**
24060, CAROBBIO DEGLI ANGELI BG (IT)
• **Wegher, Marco**
24068, SERIATE BG (IT)

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(74) Representative: **Modiano, Micaela Nadia et al**
Dr. Modiano & Associati SpA
Via Meravigli 16
20123 Milano (IT)

(71) Applicant: **CORALI S.p.A.**
24060 Carobbio degli Angeli BG (IT)

(54) **Nailing machine for assembling pallets made of wood or the like, with high precision and reliability in operation**

(57) A nailing machine for assembling pallets made of wood or the like, with high precision and reliability in operation, comprising: a supporting structure (2), which is provided with ground contact elements (3) and supports a substantially horizontal lower supporting surface (4) for the blocks (54) to be assembled below a corresponding lid (51) to provide a pallet (50), means (5) for the advancement of the blocks (54) on the lower supporting surface (4) along an advancement direction (6) and means (7) for the advancement of the lids (51) along the advancement direction (6) from a loading station (8) to a nailing station (9), in which there is a nailing surface (10) as a plane of arrangement for the upper face of the lid (51) in the nailing station (9), the supporting structure (2)

comprising a first portion (11) provided with the ground contact elements (3) and a second portion (12) movable with respect to the first part (11) along a substantially vertical direction (13), the lower supporting surface (4) and the means (5) for the advancement of the blocks (54) being mounted on the second portion (12) of the supporting structure (2) and means (14) being provided for adjusting the vertical position of the second portion (12) with respect to the first portion (11) of the supporting structure (2) to vary the vertical position of the lower supporting surface (4) and of the means (5) for the advancement of the blocks (54) with respect to the nailing surface (10) as a function of the height of the blocks (54) of the pallets (50) to be provided.

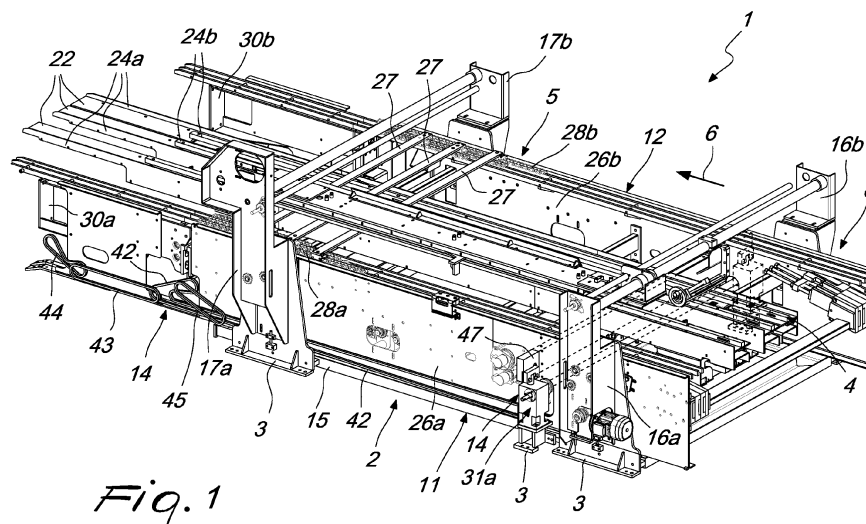


Fig. 1

Description

[0001] The present invention relates to a nailing machine for assembling pallets made of wood or the like, with high precision and reliability in operation.

[0002] As is known, pallets made of wood, an example of which is illustrated by way of non-limiting example in Figures 13 to 15 and generally designated by the reference numeral 50, are generally constituted by a loading surface, also known as "lid" 51, constituted by two layers of strips 52, 53, which are arranged side-by-side and superimposed so that the strips 52 of one layer are parallel to each other and are perpendicular to the strips 53 of the other layer, and by feet or blocks 54, which are fixed below the lid 51 so as to keep it raised with respect to the supporting surface. Usually three rows of blocks are provided and each one of these three rows is generally composed of three mutually spaced blocks so that the pallet can be "forked" by lifting devices on any one of its four sides. Generally, the lid has a rectangular plan and the blocks of the three rows are mutually connected not only by the lid but also by three strips 55, which are arranged parallel to the longer sides of the lid and are nailed to the lower face of the blocks.

[0003] A method for the production of pallets provides: a first step, in which the assembly of the strips that compose the lid is performed by nailing; a second step, in which the assembly of the lid to the blocks is performed by means of a nailing assembling machine; and finally a third step, in which the strips that connect the blocks in a downward region are nailed.

[0004] Nailing machines for performing the assembly of pallets made of wood or the like, i.e., for nailing the pre-assembled lid to the blocks, generally comprise a supporting structure that is provided with ground contact elements and supports a substantially horizontal supporting surface for the blocks to be assembled below a corresponding lid that is fed to the machine already pre-assembled. Such machines are provided with means for the advancement of the blocks on the supporting surface and of the lids, above the blocks, along an advancement direction from a loading station, in which the blocks and the lids are fed to the machine, to a nailing station, in which nailing heads operate which fix the lid to the underlying blocks.

[0005] In such machines, the supporting surface for the blocks, or lower supporting surface, is formed by substantially horizontal plate-like elements that constitute the bottom of guiding channels, which are open in the upper region and are arranged mutually side by side parallel to the advancement direction. Such guiding channels, which are provided in a number that matches the rows of blocks oriented parallel to the advancement direction, are delimited laterally by vertical side walls, which are mutually opposite and parallel with respect to the advancement direction. The blocks to be assembled below the lids are arranged inside such guiding channels.

[0006] The means for the advancement of the blocks

along the advancement direction are constituted by sliders which, at the lower supporting surface, are moved along the advancement direction. More particularly, such sliders are constituted by strips which are arranged parallel to the lower supporting surface and are oriented transversely to the advancement direction. The sliders are fixed, at their longitudinal ends, to one or more pairs of chains, which have one of their portions arranged parallel to the advancement direction and can be actuated in order to cause progressively the advancement of the blocks along the guiding channels from the loading station to the nailing station and then from there to an unloading station of the machine.

[0007] In nailing machines of the known type, the plate-like elements, which delimit in a downward region the guiding channels and form the lower supporting surface, are fixed to the portion of the supporting structure that rests on the ground, while the sliders that cause the advancement of the blocks may be moved vertically with respect to the lower supporting surface so as to adapt the position of the sliders to the height of the blocks.

[0008] Moreover, in conventional nailing machines the sliders that cause the advancement of the blocks on the supporting surface also cause the advancement of the lids, supported by adapted guides which are arranged above the lower supporting surface and form an upper supporting surface for the lids, from the loading station to the nailing station.

[0009] Such nailing machines suffer some problems.

[0010] A first problem is that when the machine has to operate with blocks of considerable height, since the sliders also have to actuate the advancement of the overlying lid, the distance of the sliders from the lower supporting surface must be increased according to the height of the blocks. For this reason, with blocks of considerable height the sliders act on a portion of the blocks that is far from the lower supporting surface. This fact may cause easily the tipping of the blocks during their handling on the lower supporting surface. This risk of tipping of the blocks is even higher if the blocks have irregularities or rounded regions on their face that makes contact with the lower supporting surface.

[0011] Another problem is the impossibility to use these machines for the production of pallets with very shallow heights, i.e., with blocks of reduced height, because in conventional machines the distance of the sliders of the lower supporting surface cannot drop below a preset measurement, generally below 100 mm. Moreover, with blocks whose height is slightly greater than this height limit it is necessary to insert spacers between the lower supporting surface and the base of the blocks in order to allow the sliders to contact the blocks.

[0012] A further problem consists in the difficulties in adjusting the sliders as regard engagement with the lids if it is necessary to provide pallets with lids that have portions that protrude with respect to the blocks.

[0013] The aim of the present invention is to solve the problems cited above, by providing a nailing machine for

assembling pallets made of wood or the like that ensures the correct advancement of the blocks along the lower supporting surface, both with blocks of modest height, without requiring the use of additional elements, and with higher blocks and with the presence of irregularities or rounded portions on the face thereof that engages the lower supporting surface.

[0014] Within this aim, an object of the invention is to provide a nailing machine that can provide pallets with reduced height, i.e., having an overall height of even less than 100 mm.

[0015] Another object of the invention is to provide a nailing machine that also ensures high precision in the advancement of the lids, even if the lids are required to protrude with respect to the blocks.

[0016] 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 supporting structure, which is provided with ground contact elements and supports a substantially horizontal lower supporting surface for the blocks to be assembled below a corresponding lid to provide a pallet, means for the advancement of the blocks on said lower supporting surface along an advancement direction and means for the advancement of the lids along said advancement direction from a loading station to a nailing station, in which there is a nailing surface as a plane of arrangement for the upper face of the lid in said nailing station, characterized in that said supporting structure comprises a first portion provided with said ground contact elements and a second portion movable with respect to said first portion along a substantially vertical direction; said lower supporting surface and said means for the advancement of the blocks being mounted on said second portion of the supporting structure, means being provided for adjusting the vertical position of said second portion with respect to said first portion of the supporting structure to vary the vertical position of said lower supporting surface and of said means for the advancement of the blocks with respect to said nailing surface as a function of the height of the blocks of the pallets to be provided.

[0017] 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 elements omitted for greater clarity;

Figure 2 is an enlarged-scale view of a detail of Figure 1 related to a longitudinal end of the machine;

Figure 3 is a schematic lateral elevation view of the machine according to the invention, with some elements omitted for greater clarity;

Figure 4 is a schematic top plan view of the machine

according to the invention, with some elements omitted for greater clarity;

Figure 5 is a schematic perspective view of a detail of the machine according to the invention related to the longitudinal end that is opposite with respect to the end shown in Figure 2;

Figure 6 is a schematic perspective view of the machine according to the invention, limited to some elements that compose it, in order to highlight the means for adjusting the vertical position of the second portion with respect to the first portion of the supporting structure;

Figure 7 is a view, similar to Figure 5 and taken from a different angle with respect to Figure 5, of the machine according to the invention, in order to highlight the means for adjusting the vertical position of the second portion with respect to the first portion of the supporting structure;

Figure 8 is a perspective view of one of the means for adjusting the vertical position of the second portion with respect to the first portion of the supporting structure;

Figure 9 is a schematic sectional view, taken along a horizontal plane, of a pair of means for adjusting the vertical position of the second portion with respect to the first portion of the supporting structure;

Figure 10 is a schematic sectional view of Figure 8, taken along the line X-X;

Figure 11 is a partially sectional schematic front elevation view of the machine according to the invention, with some elements omitted for greater clarity;

Figure 12 is a schematic perspective view of a portion of the machine according to the invention, with some elements omitted for greater clarity;

Figure 13 is a top plan view of a pallet that can be obtained with the machine according to the invention;

Figure 14 is a front elevation view of the pallet of Figure 13;

Figure 15 is a side elevation view of the pallet of Figure 13.

[0018] With reference to the figures, the machine according to the invention, generally designated by the reference numeral 1, comprises a supporting structure 2, which is provided with ground contact elements 3 and supports a substantially horizontal lower supporting surface 4 for the blocks 54 to be assembled below a corresponding lid 51 in order to provide a pallet 50. The machine comprises means 5 for the advancement of the blocks 54 on the lower supporting surface 4 along an advancement direction, indicated by the arrow 6, and means 7 for the advancement of the lids 51 along the same advancement direction 6 from a loading station 8, located proximate to a longitudinal end of the machine, to a nailing station 9, which is located in an intermediate region of the longitudinal extension of the machine. In the nailing station 9, in a per se known manner, a nailing

surface 10 is provided, which constitutes the plane on which the nailing heads work in order to assemble the lid 51 to the underlying blocks 54. The upper face of the lid 51, at the nailing station 9, must lie on the nailing surface 10.

[0019] According to the invention, the supporting structure 2 comprises substantially a first portion 11, which is provided with the ground contact elements 3, and a second portion 12, which can be moved with respect to the first portion 11 along a substantially vertical direction 13. The lower supporting surface 4 and the means 5 for the advancement of the blocks 54 are mounted on the second portion 12 of the supporting structure 2 and there are means 14 for adjusting the vertical position of the second portion 12 with respect to the first portion 11 of the supporting structure 2 in order to vary the vertical position of the lower supporting surface 4 and of the means 5 for the advancement of the blocks 54 with respect to the nailing surface 10 as a function of the height of the blocks 54 of the pallets 50 to be provided.

[0020] More particularly, the first portion 11 of the supporting structure 2 comprises a base 15, provided with the ground contact elements 3, from which pairs of posts 16a, 16b, 17a, 17b, 18a, 18b, each composed of two posts which are arranged laterally, on mutually opposite sides, with respect to a vertical central plane of the machine that is parallel to the advancement direction 6. More particularly, the pair of posts 18a, 18b forms the nailing station 9 and supports a substantially horizontal beam 19, which is oriented at right angles to the advancement direction 6 and supports, in a per se known manner, the nailing heads, of a known type and not illustrated for the sake of simplicity, designed to mutually assemble the lids 51 and the underlying blocks 54.

[0021] The pairs of posts 16a, 16b and 17a, 17b support plate-like elements 20 that form an upper supporting surface 21, which is substantially parallel to the lower supporting surface 4 and is designed to support the lids 51 during their advancement toward the nailing station 9, as will become better apparent hereinafter.

[0022] The lower supporting surface 4 is defined by substantially horizontal plate-like elements 22 that constitute the bottom of guiding channels 23 that are arranged mutually side by side and parallel to the advancement direction 6.

[0023] These guiding channels 23 are open in an upper region and are delimited laterally by side walls 24a, 24b, which are parallel to the advancement direction 6. At least one of these side walls can move with respect to the other one so as to allow to vary the width of the guiding channels 23 in order to adapt it to the width of the blocks 54 that are placed on the plate-like elements 22 and are made to move forward inside the guiding channels 23 from the loading station 8 to the nailing station 9 and then to an unloading station 25, illustrated in particular in Figure 5, which is located at the longitudinal end of the machine that is opposite with respect to the longitudinal end occupied by the loading station 8, illustrated in particular

in Figure 2.

[0024] The guiding channels 23, or rather the elements that compose them, are connected to a pair of sides 26a, 26b that belong to the second portion 12 of the supporting structure 2 so as to be integral with said sides 26a, 26b, i.e., with the second portion 12 of the supporting structure 2, in its translation with respect to the first portion 11 along the vertical direction 13.

[0025] The sides 26a, 26b are arranged on a vertical plane and are oriented parallel to the advancement direction 6. The sides 26a, 26b are arranged between the pairs of posts 16a, 16b, 17a, 17b, 18a, 18b.

[0026] The means 5 for the advancement of the blocks 54 comprise sliders 27, which are arranged parallel to the lower supporting surface 4 and are oriented at right angles to the advancement direction 6. These sliders 27 are movable, above the lower supporting surface 4, parallel to the advancement direction 6 and are integral with the lower supporting surface 4 and the second portion 12 of the supporting structure 2, i.e., to the sides 26a, 26b in translation with respect to the first portion 11 of the supporting structure 2 along the vertical direction 13.

[0027] In this manner, the distance of the sliders 27 from the lower supporting surface 4 remains constant in the translation of the second portion 12 of the supporting structure 2 with respect to the first portion 11 of the supporting structure 2 along the vertical direction 13.

[0028] More particularly, the sliders 27 are constituted by strips which are fixed, at their longitudinal ends, to a corresponding pair of chains 28a, 28b that engage pinions 29a, 29b arranged with their axis horizontally and at right angles to the advancement direction 6 so that each pair of chains 28a, 28b has a portion that extends above the lower supporting surface 4 parallel to the advancement direction 6. The pinions 29a, 29b with which the chains 28a, 28b, that support the sliders 27 engage are supported, so that they can rotate about the corresponding axes, by the sides 26a, 26b or by supporting plates 30a, 30b, which are fixed to the sides 26a, 26b, so that the assembly constituted by the pinions 29a, 29b, the chains 28a, 28b and the sliders 27 is integral with the sides 26a, 26b and thus to the second portion 12 of the supporting structure 2 in its translation along the vertical direction 13 with respect to the first portion 11 of the supporting structure 2.

[0029] The sliders 27 are mutually spaced along the advancement direction 6 as a function of the distance of the rows of blocks 54 to be assembled below a corresponding lid 51 in order to provide a pallet 50, and refinements or devices may be provided in order to vary the spacing of the sliders 27 along the advancement direction 6 of a known type or of the type disclosed in a co-pending patent application by the same Applicant, to which reference is made for completeness of description as regards to the actuation of the means 5 for the advancement of the blocks 54.

[0030] The adjustment means 14 comprise lifting elements 31a, 31b, 32a, 32b, 33a, 33b, which are mutually

spaced along the advancement direction 6 and are interposed between the first portion 11 and the second portion 12 of the supporting structure 2.

[0031] The lifting elements 31a, 31b, 32a, 32b, 33a, 33b comprise pairs of lifting elements with two lifting elements of a same pair arranged laterally and on mutually opposite sides with respect to a vertical central plane which is parallel to the advancement direction 6.

[0032] Conveniently, each lifting element 31a, 31b, 32a, 32b, 33a, 33b is a mechanically-actuated lift and the several lifting elements are kinematically connected to each other so as to produce identical vertical movements of the several regions of the second portion 12 of the supporting structure 2 to which they are connected.

[0033] The lifting elements 31a, 31b, 32a, 32b, 33a, 33b comprise three pairs of lifting elements, which are arranged respectively proximate to the ends of the machine, in its extension parallel to the advancement direction 6, and in an intermediate region. A first pair of lifting elements 31a, 31b is arranged proximate to the loading station 8, a second pair of lifting elements 32a, 32b is arranged proximate to the nailing station 9 and a third pair of lifting elements 33a, 33b is arranged proximate to the unloading station 25.

[0034] In the illustrated embodiment, each lifting element is of the type shown in Figures 8 to 10, which refer more precisely to the lifting element 31a, 31b, i.e., is composed of a lead screw 34 which is formed around the axis of a helical gear 35 which meshes with a worm screw 36. The helical gear 35 is supported, so that it can rotate about its own axis, which is vertically oriented, by a supporting element 37 that rests, in a downward region, on the base 15. The worm screw 36 is supported, so that it can rotate about its own axis, which is arranged horizontally and is oriented at right angles to the advancement direction 6, by the same supporting element 37. The lead screw 34 engages a threaded shaft 38 that protrudes upwardly from the supporting element 37 and engages a region of the second portion 12 of the supporting structure 2. The worm screw 36 of a lifting element is jointly connected in rotation about its own axis to the worm screw of the other lifting element that belongs to the same pair by means of a connecting shaft 39, 40, 41. In practice, in the illustrated embodiment three connecting shafts 39, 40, 41 are provided, which are arranged so that their axes are horizontal and are oriented at right angles to the advancement direction 6. These connecting shafts 39, 40, 41 are kinematically connected to each other, in their rotation about their own axes, by means of chains 42, 43, 44 that mesh with pinions 65 keyed on the same connecting shafts 39, 40, 41 and with guiding pinions. The connecting shaft 40 is further connected, by means of a corresponding chain 45, to a motor or gearmotor 46, which due to the kinematic connection that exists between the several connecting shafts 39, 40, 41, actuates simultaneously all the connecting shafts 39, 40, 41 and thus causes the lifting or lowering of the threaded shafts 38 and, consequently, the lifting or lowering of the second

portion 12 with respect to the first portion 11 of the supporting structure 2.

[0035] The threaded shafts 38 of the first pair of lifting elements 31a, 31b are fixed to the longitudinal ends of a cross-member 47, which is arranged horizontally and at right angles to the advancement direction 6 and rigidly connects the sides 26a, 26b to each other.

[0036] The threaded shafts 38 of the second pair of lifting elements 32a, 32b also are fixed to a cross-member 48, which is horizontal and at right angles to the advancement direction 6 and rigidly connects the sides 26a, 26b to each other.

[0037] Conveniently, guiding means are provided for guiding the second portion 12 with respect to the first portion 11 of the supporting structure 2 along the vertical direction 13. Such guiding means comprise a pair of vertical guides 49a, 49b, which are fixed to the first portion 11 of the supporting structure 2 and accommodate, so that they can slide, the ends of the cross-member 48. More particularly, the vertical guides 49a, 49b are fixed to the two posts 18a, 18b located at the nailing station 9.

[0038] The threaded shafts 38 of the third pair of lifting elements 33a, 33b located proximate to the unloading station 25 are connected, with their upper end, to the supporting plates 30a, 30b, which in turn, as mentioned, are rigidly fixed to the sides 26a, 26b.

[0039] The means 7 for the advancement of the lids 51 comprise a pair of chains 60a, 60b, each of which engages a pair of pinions 61a, 61b, 62a, 62b, which have vertical axes and face each other with their portion that is arranged parallel to the advancement direction 6. The chains 60a, 60b are provided with traction elements 63, which are mutually spaced and can engage the side of the lid 51 that is directed opposite with respect to the advancement direction 6 so as to push the lid 51 along the advancement direction 6.

[0040] More particularly, as shown particularly in Figures 11 and 12, the two mutually facing portions of the chains 60a, 60b are arranged laterally and on mutually opposite sides with respect to the plate-like elements 20 on which the lids 51 are loaded. The traction elements 63 are constituted, for example, by paddles, which are mutually spaced along the extension of the corresponding chain 60a, 60b and which, as a consequence of the actuation of the chains 60a, 60b, engage in each instance the side of a lid 51 arranged on the plate-like elements 20, directed opposite with respect to the advancement direction 6. A pair of pinions, which is constituted in the case shown by the pair of pinions 61a, 61b, with which the chains 60a, 60b mesh, is actuated with a rotary motion about the corresponding axes by a corresponding motor 64 connected to one of the posts 17a, 17b.

[0041] Operation of the machine according to the invention is as follows.

[0042] The blocks 54 are arranged inside the guiding channels 23 and are made to advance along said guiding channels 23 by the actuation of the chains 28a, 28b to which the sliders 27 that engage the side of the blocks

54 that is oppositely directed with respect to the advancement direction 6 are connected. The existing spacing between the sliders 27 ensures the correct spacing between the rows of blocks 54 along the advancement direction 6.

[0043] The lids 51 are placed instead on the plate-like elements 20 and made to advance along the advancement direction 6 by the traction elements 63 that are connected to the pair of chains 60a, 60b.

[0044] It should be noted that the means 5 for the advancement of the blocks 54, in the machine according to the invention, are separate with respect to the means 7 for the advancement of the lids 51. Thanks to this fact, it is possible to manage without problems the advancement of the lids 51 with respect to the advancement of the blocks 54 in the provision of pallets 50 for which the lid 51 must have portions that protrude with respect to the underlying blocks 54.

[0045] When the height of the blocks 54 to be fixed below the lids 51 varies, one proceeds by actuating the motor or gearmotor 46, which by way of the existing kinematic connection to the various lifting elements 31a, 31b, 32a, 32b, 33a, 33b causes the lifting or lowering of the second portion 12 with respect to the first portion 11 of the supporting structure 2.

[0046] Since, according to the invention, the means 5 for the advancement of the blocks 54 and the lower supporting surface 4 are jointly connected to the second portion 12 of the supporting structure 2 in translation with respect to the first portion 11 along the vertical direction 13, the existing distance between the means 5 for the advancement of the blocks 54 and the lower supporting surface 4 remains constant as the vertical position of the lower supporting surface 4 varies. Due to this fact, the sliders 27 of the means 5 for the advancement of the blocks 54 are always arranged at an optimum distance from the lower supporting surface 4. In particular, this distance can be such to keep the sliders 27 proximate to the lower end of the blocks 54, so as to avoid the danger of a tipping of the blocks 54 during their advancement toward the nailing station 9 and can even be lower than the minimum height required for the blocks 54, so as to be able to assemble pallets of reduced height, even lower than 100 mm, and handle blocks 54 of reduced height without requiring the use of additional elements in order to raise them.

[0047] In practice it has been found that the machine according to the invention fully achieves the intended aim, since it can handle blocks of different heights while maintaining the engagement of the means for the advancement of the blocks with said blocks in an optimum condition.

[0048] A further advantage of the machine according to the invention is the ability to assemble even pallets for which the lid is required to protrude with respect to the blocks, without requiring onerous manual adjustment operations.

[0049] The disclosures in Italian Patent Application No. MI2010A000496 from which this application claims pri-

ority are incorporated herein by reference.

[0050] 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 supporting structure (2), which is provided with ground contact elements (3) and supports a substantially horizontal lower supporting surface (4) for the blocks (54) to be assembled below a corresponding lid (51) to provide a pallet (50), means (5) for the advancement of the blocks (54) on said lower supporting surface (4) along an advancement direction (6) and means (7) for the advancement of the lids (51) along said advancement direction (6) from a loading station (8) to a nailing station (9), in which there is a nailing surface (10) as a plane of arrangement for the upper face of the lid (51) in said nailing station (9), **characterized in that** said supporting structure (2), comprises a first portion (11) provided with said ground contact elements (3) and a second portion (12) movable with respect to said first portion (11) along a substantially vertical direction (13); said lower supporting surface (4) and said means (5) for the advancement of the blocks (54) being mounted on said second portion (12) of the supporting structure (2), means (14) being provided for adjusting the vertical position of said second portion (12) with respect to said first portion (11) of the supporting structure (2) to vary the vertical position of said lower supporting surface (4) and of said means (5) for the advancement of the blocks (54) with respect to said nailing surface (10) as a function of the height of the blocks (54) of the pallets (50) to be provided.
2. The machine according to claim 1, **characterized in that** said means (5) for the advancement of the blocks (54) comprise sliders (27) arranged parallel to said lower supporting surface (4) and oriented at right angles to said advancement direction (6), said sliders (27) being movable, above said lower supporting surface (4), parallel to said advancement direction (6), and being jointly connected to said lower supporting surface (4) and to said second portion (12) of the supporting structure (2) in translation with respect to said first portion (11) of the supporting structure (2) along said substantially vertical direction (13).
3. The machine according to claim 1, **characterized**

- in that** said second portion (12) of the supporting structure (2) comprises a pair of side walls (26a, 26b) which are connected to guiding channels (23), said guiding channels being open in an upper region and being delimited in a lower region by substantially horizontal plate-like elements (22) that form said lower supporting surface (4) and, laterally, by vertical side walls (24a, 24b) which are mutually opposite and parallel with respect to said advancement direction (6).
4. The machine according to one or more of the preceding claims, **characterized in that** said adjustment means (14) comprise lifting elements (31a, 31b, 32a, 32b, 33a, 33b) which are mutually spaced along said advancement direction (6) and are interposed between said first portion (11) and said second portion (12) of the supporting structure (2).
 5. The machine according to one or more of the preceding claims, **characterized in that** said lifting elements (31a, 31b, 32a, 32b, 33a, 33b) comprise pairs of lifting elements (31a, 31b, 32a, 32b, 33a, 33b) with the two lifting elements of a same pair arranged laterally and on mutually opposite sides with respect to a vertical central plane which is parallel to said advancement direction (6).
 6. The machine according to one or more of the preceding claims, **characterized in that** each lifting element (31a, 31b, 32a, 32b, 33a, 33b) is a mechanically actuated lifting element and **in that** the several lifting elements (31a, 31b, 32a, 32b, 33a, 33b) are kinematically connected to each other in order to produce identical vertical movements of the several regions of said second portion (12) of the supporting structure (2) to which they are connected.
 7. The machine according to one or more of the preceding claims, **characterized in that** said lifting elements (31a, 31b, 32a, 32b, 33a, 33b) comprise three pairs of lifting elements arranged respectively proximate to the ends of the machine, in its extension parallel to the advancement direction, and in an intermediate region.
 8. The machine according to one or more of the preceding claims, **characterized in that** at least one pair of said lifting elements (31a, 31b, 32a, 32b, 33a, 33b) is connected to a cross-member (47, 48) arranged perpendicularly to said advancement direction (6) and mutually connects said side walls (26a, 26b).
 9. The machine according to one or more of the preceding claims, **characterized in that** it comprises means (49a, 49b) for guiding said second portion (12) with respect to said first portion (11) of the supporting structure (2) along said substantially vertical direction (13).
 10. The machine according to one or more of the preceding claims, **characterized in that** said guiding means comprise vertical guides (49a, 49b), which are fixed to said first portion (11) of the supporting structure (2) and accommodate slidably the ends of said cross-member (48).
 11. The machine according to one or more of the preceding claims, **characterized in that** said advancement means (7) for the lids (51) are separate from the means (5) for the advancement of the blocks (54).
 12. The machine according to one or more of the preceding claims, **characterized in that** said means (7) for the advancement of the lids (51) comprise a pair of chains (60a, 60b), each of which engages a pair of pinions (61a, 61b, 62a, 62b) which have vertical axes and face each other with one of their portions arranged parallel to said advancement direction (6); said chains (60a, 60b) being provided with mutually spaced traction elements (63), engageable to the side of a lid (51) that is directed opposite with respect to the advancement direction (6) in order to push the lid (51) along said advancement direction (6).

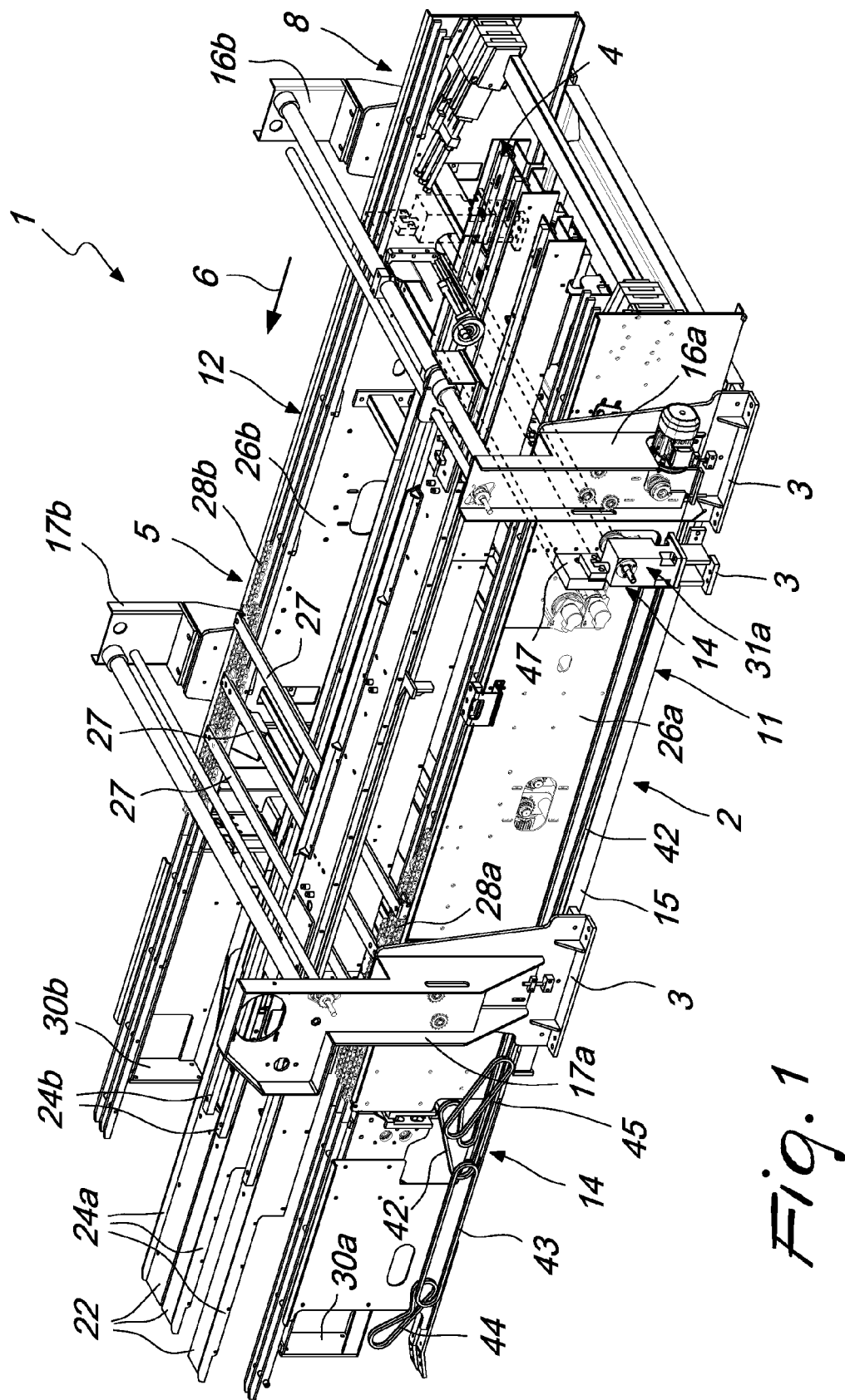
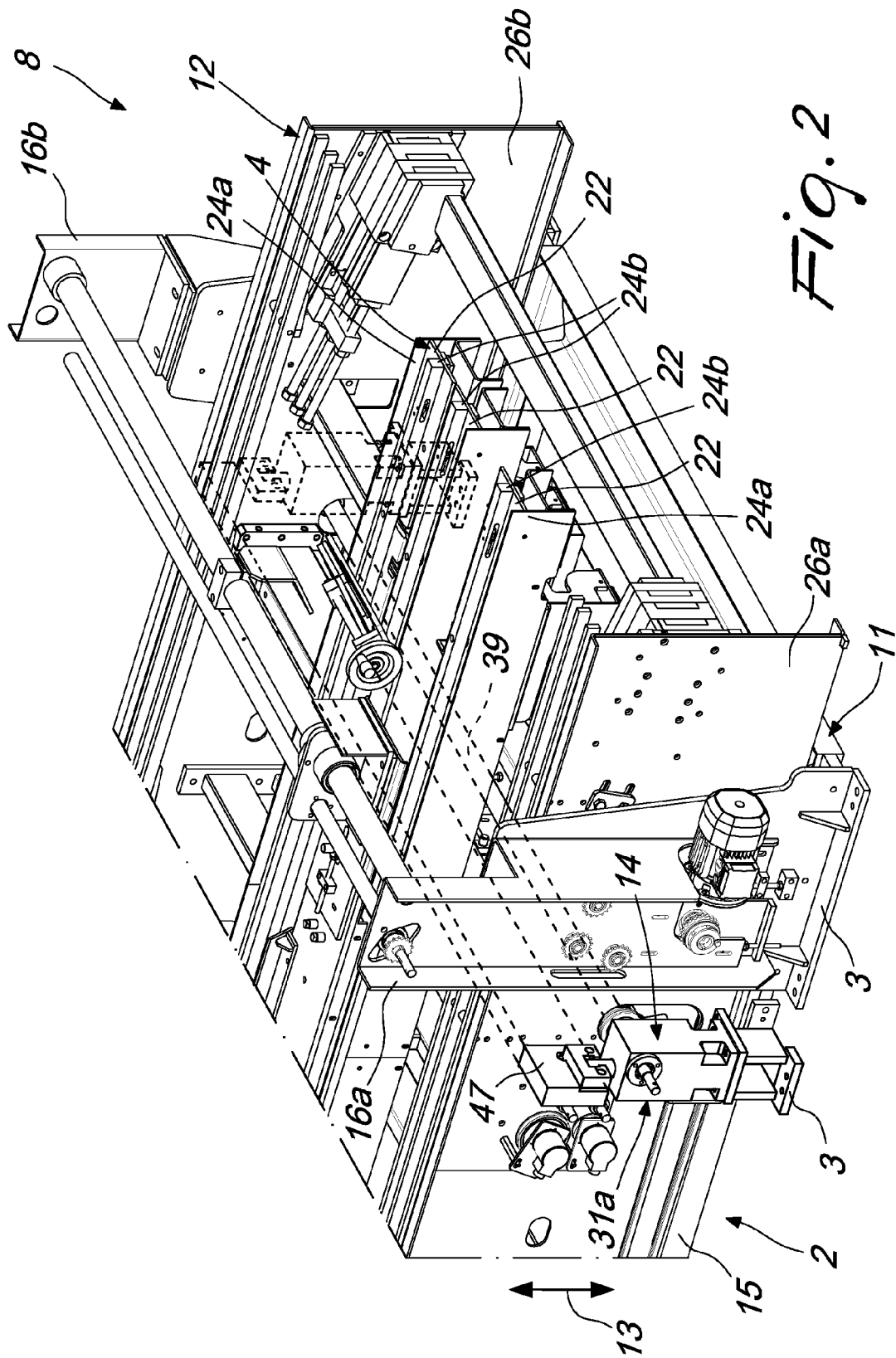


Fig. 1



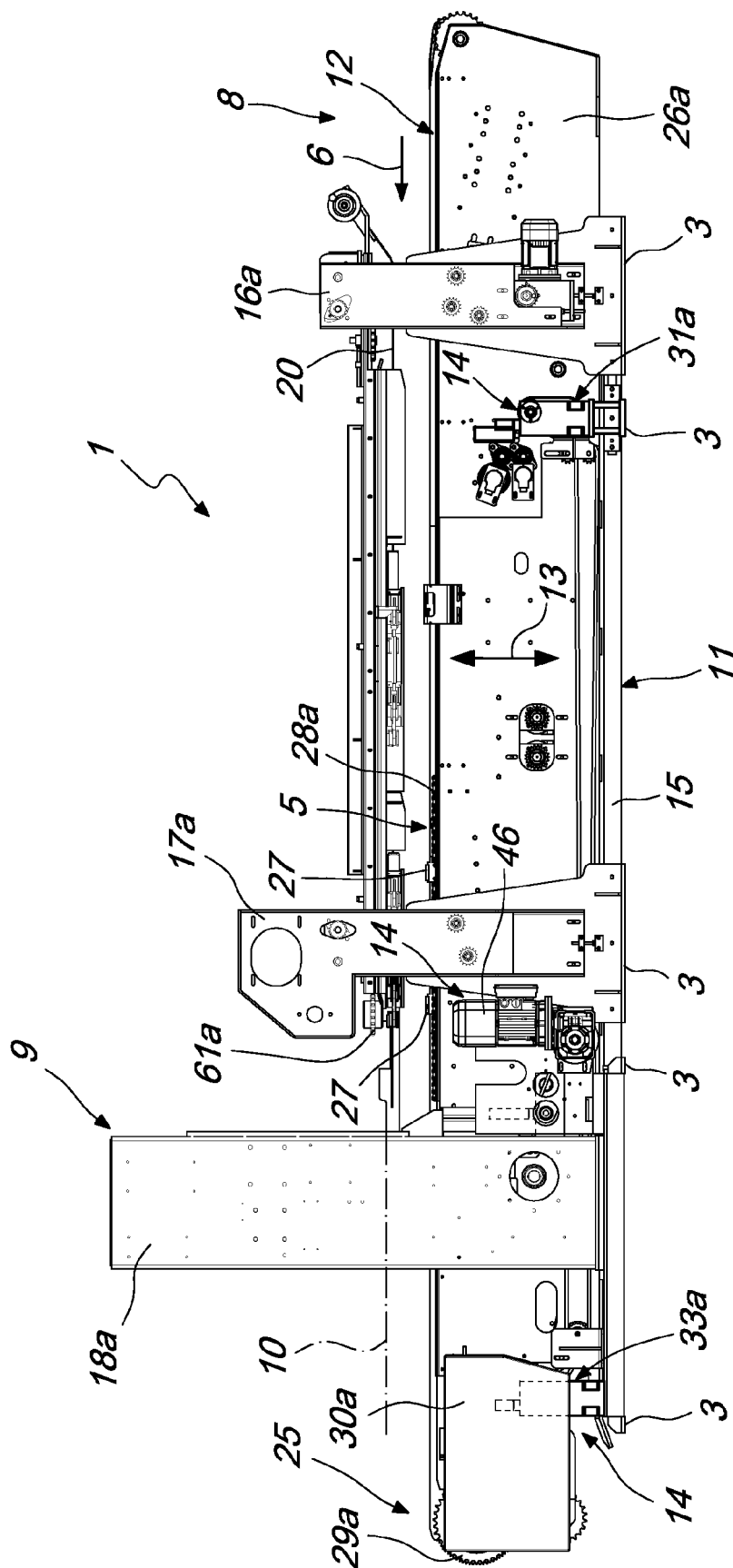


Fig. 3

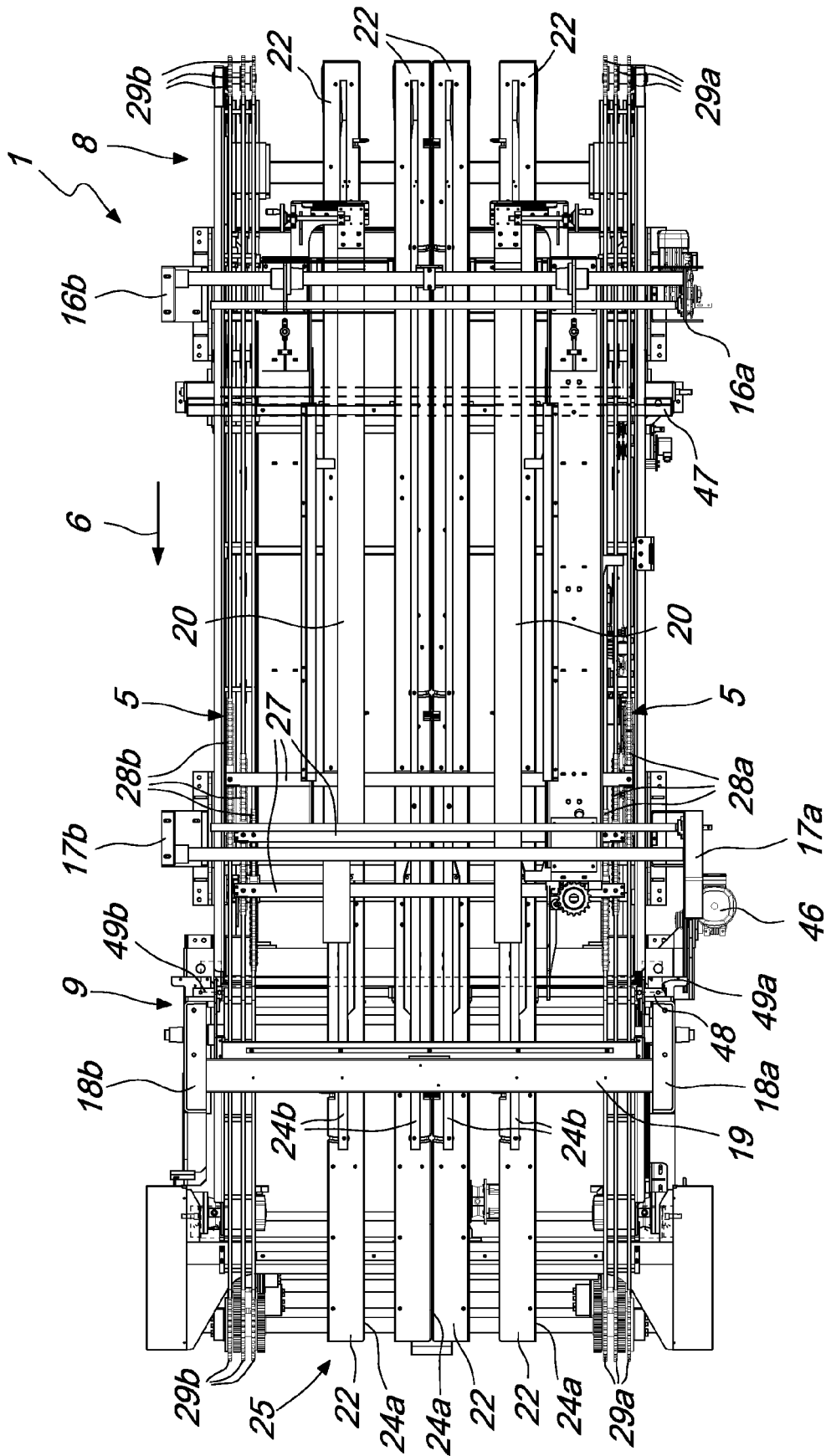
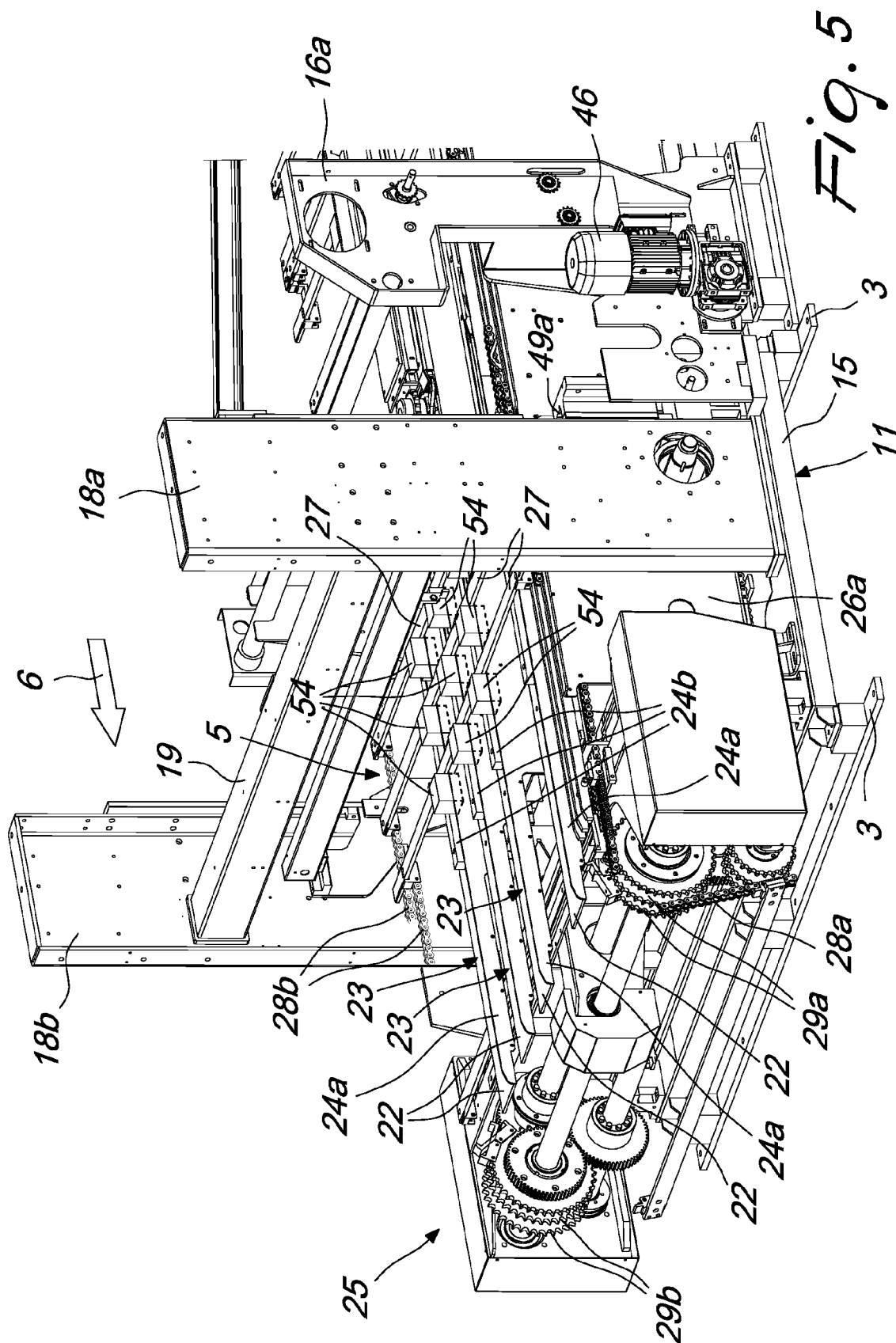
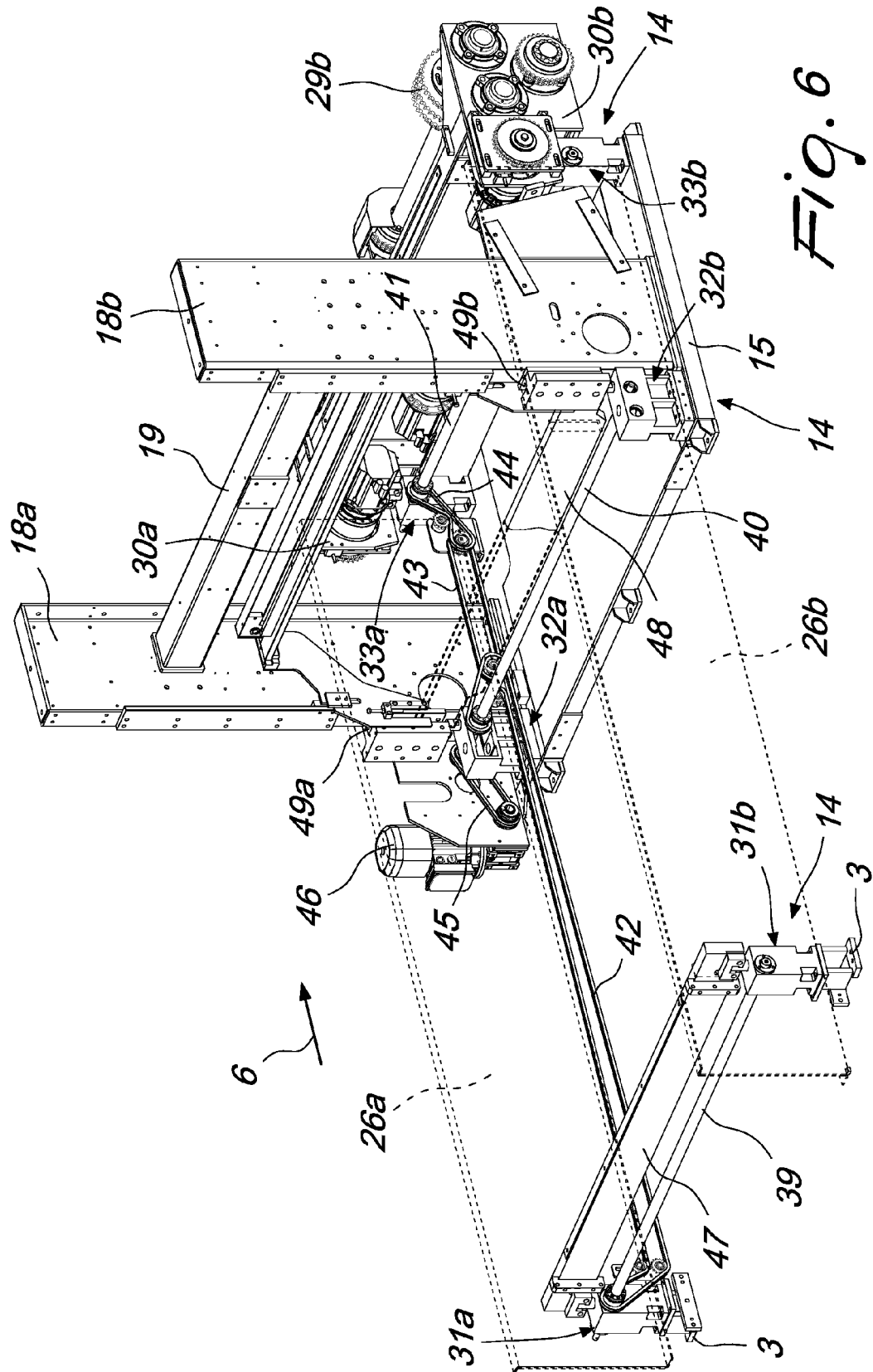


Fig. 4





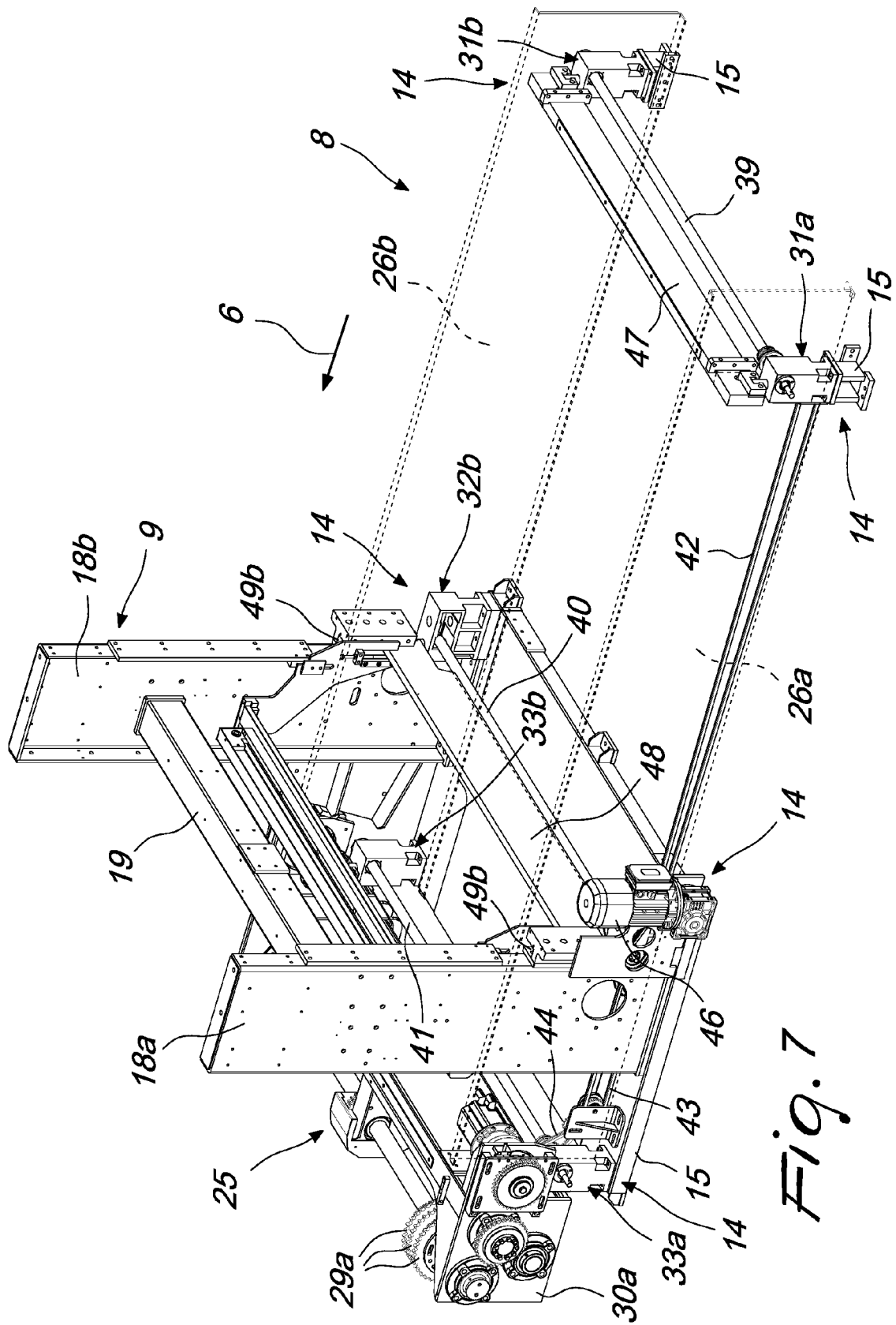


Fig. 7

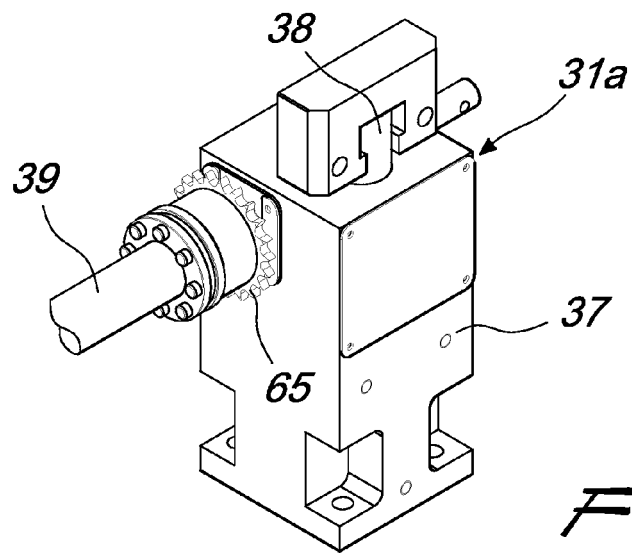


Fig. 8

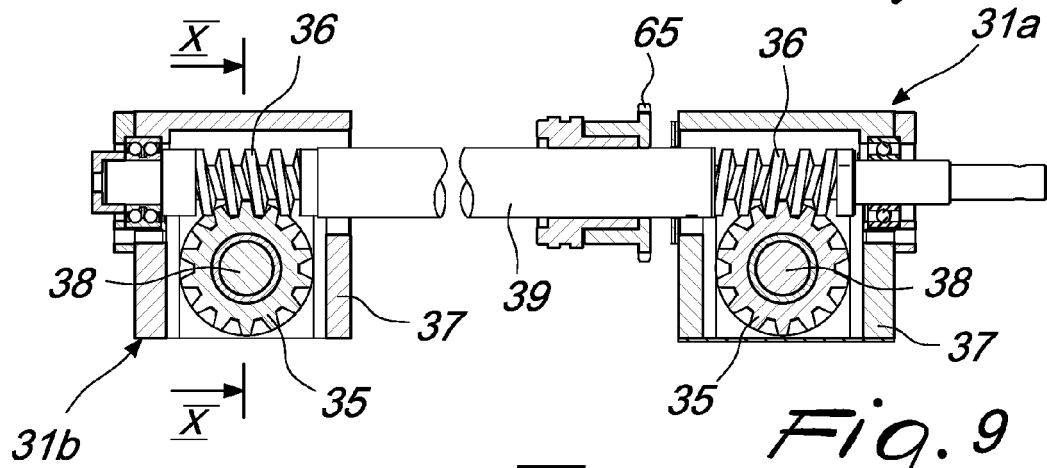


Fig. 9

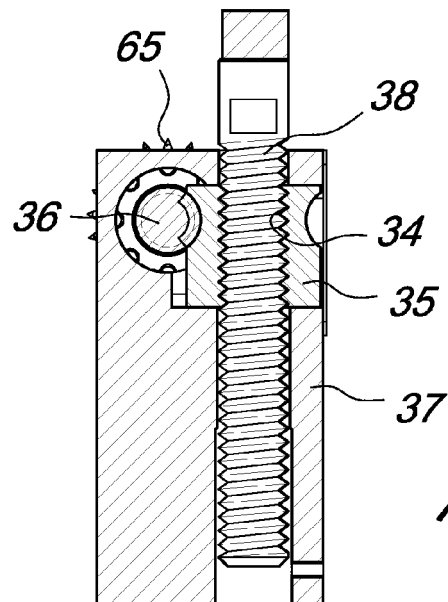


Fig. 10

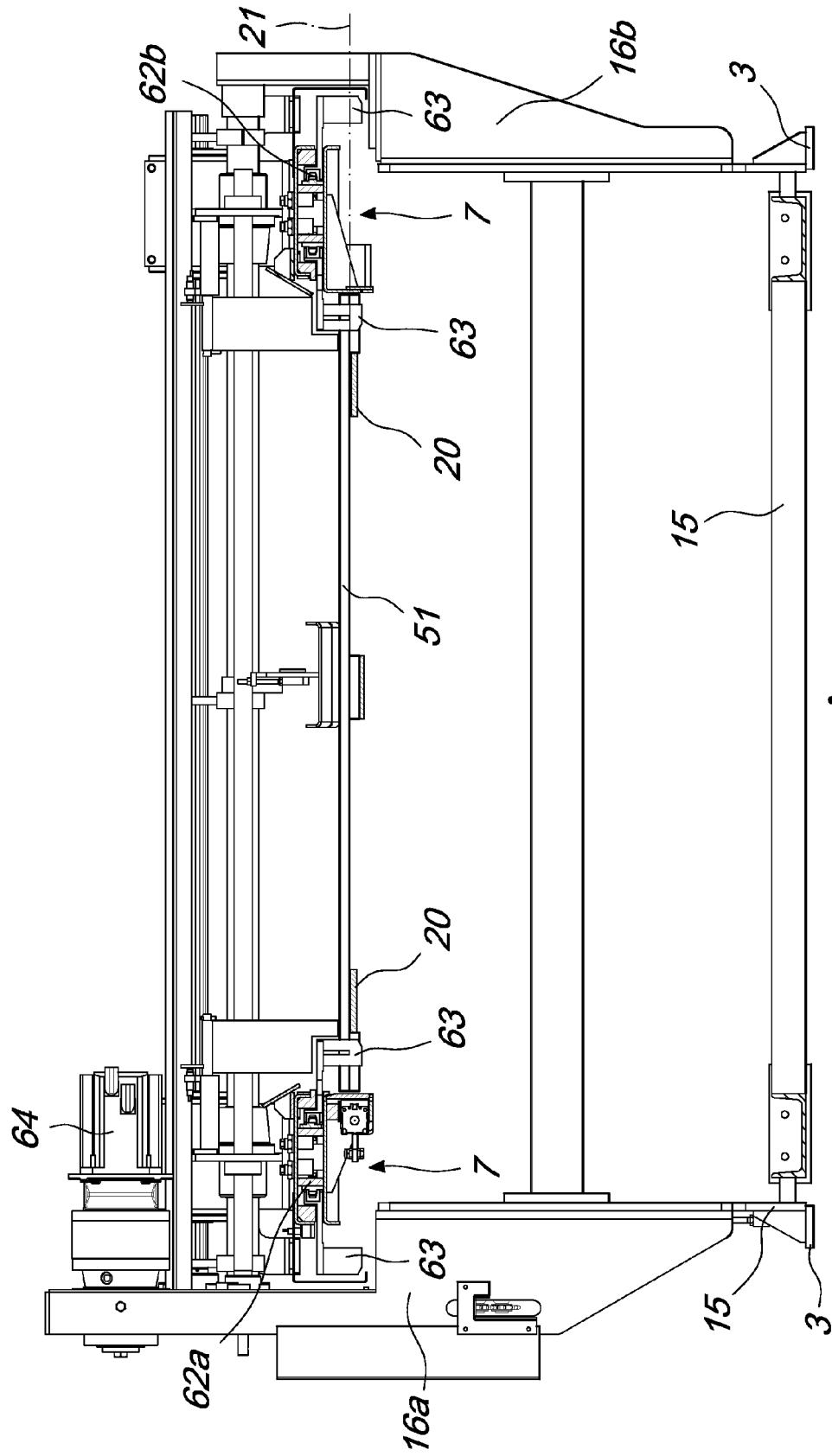


Fig. 11

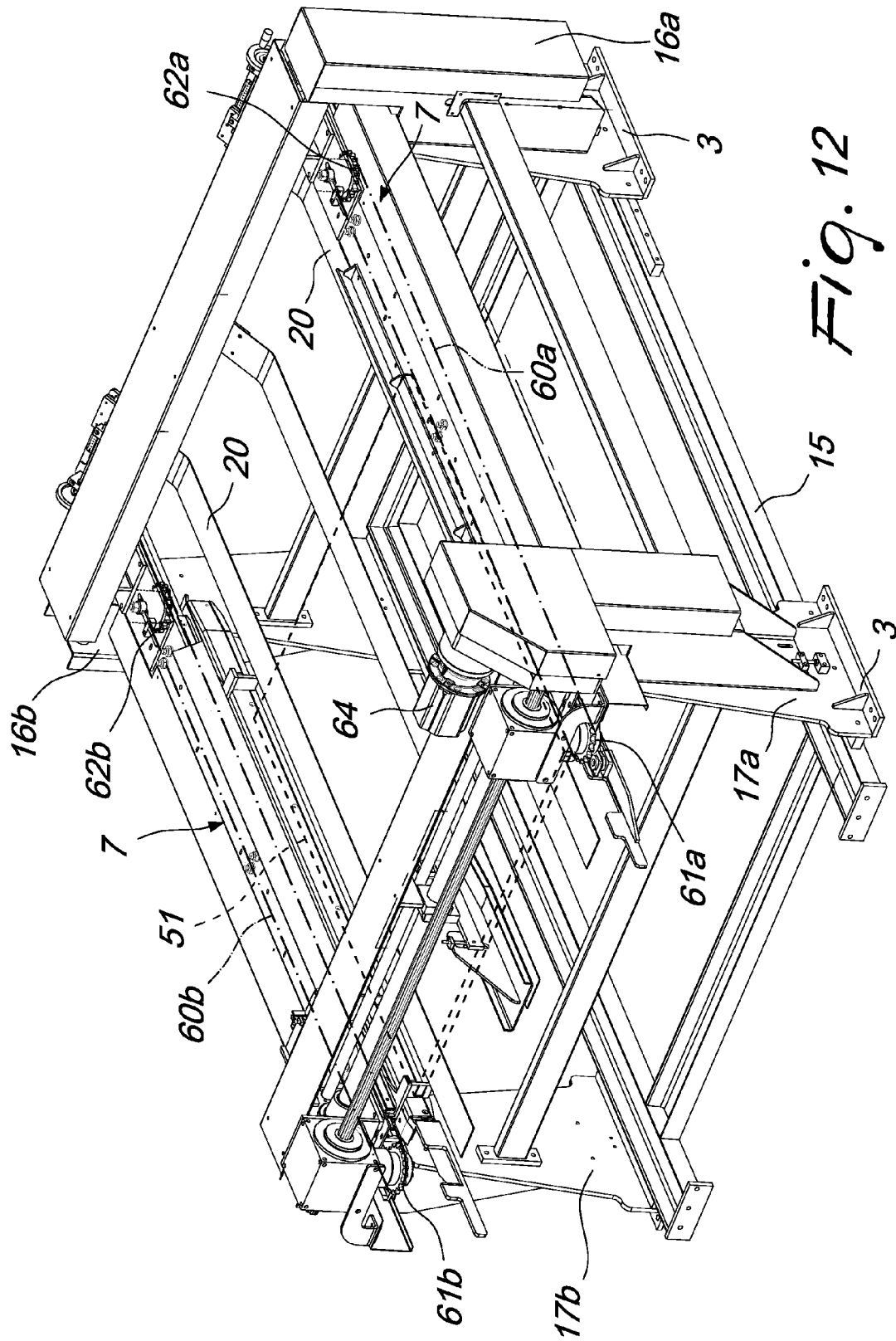
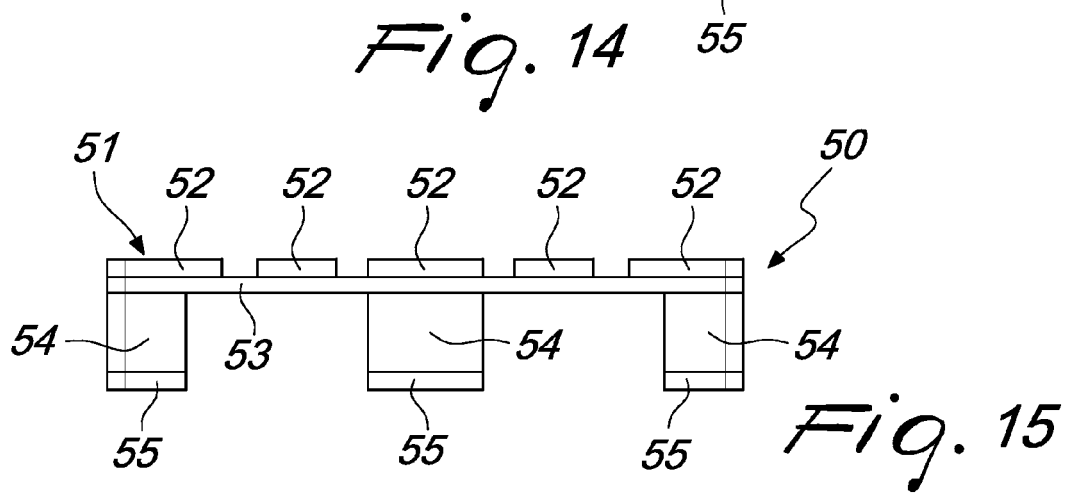
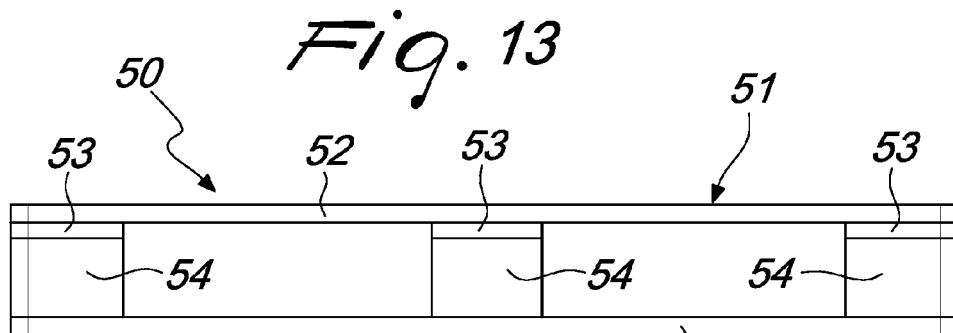
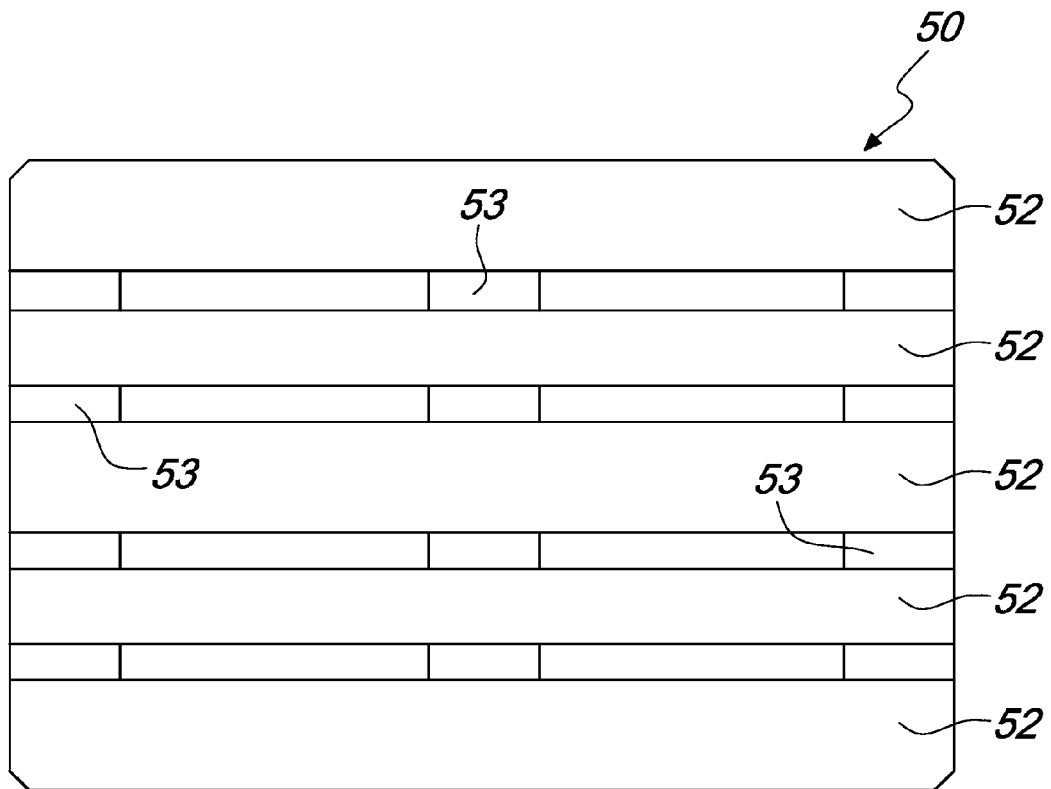


Fig. 12





EUROPEAN SEARCH REPORT

Application Number
EP 11 15 8190

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 4 133 097 A (SLADE EDGAR O) 9 January 1979 (1979-01-09) * abstract * * figures * * column 1, line 4 - line 7 * * column 2, line 6 - line 12 * * column 4, line 46 - line 49 * * column 5, line 31 - line 45 * * column 9, line 48 - line 58 * -----	1-12	INV. B27F7/00 B27M3/00
A	US 2 643 377 A (PAXTON GERALD C) 30 June 1953 (1953-06-30) * the whole document * -----	1,3	
A	WO 01/87558 A2 (EURE KARL M [US]) 22 November 2001 (2001-11-22) * the whole document * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B27F B27M
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 June 2011	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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EPO FORM 1503 03.82 (P04C01)

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ON EUROPEAN PATENT APPLICATION NO.**

EP 11 15 8190

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The members are as contained in the European Patent Office EDP file on
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16-06-2011

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