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(54) **MACHINE FOR ASSEMBLING PALLETS**

(57) A machine (1) for assembling pallets comprising a support structure (2), a framework (3) for assembling a pallet (16) formed of parts (161-164), the framework (3) being housable within the support structure (2), one upright (5) movable on the support structure (2) and provided with at least one front nailing device (6) for nailing the parts (161-164) of the pallet (16), the machine (1) has a vertical movement apparatus for vertically displacing the front nailing means (6) on the movable upright (5), which also comprises on the rear part one abutment element (13) vertically movable by means of a movement apparatus in a coordinated manner with the front nailing device (6), the abutment element (13) being designed to close or rivet at the back the nails or staples inserted by the front nailing device (6) into parts of a pallet (16) supported by the framework (3).

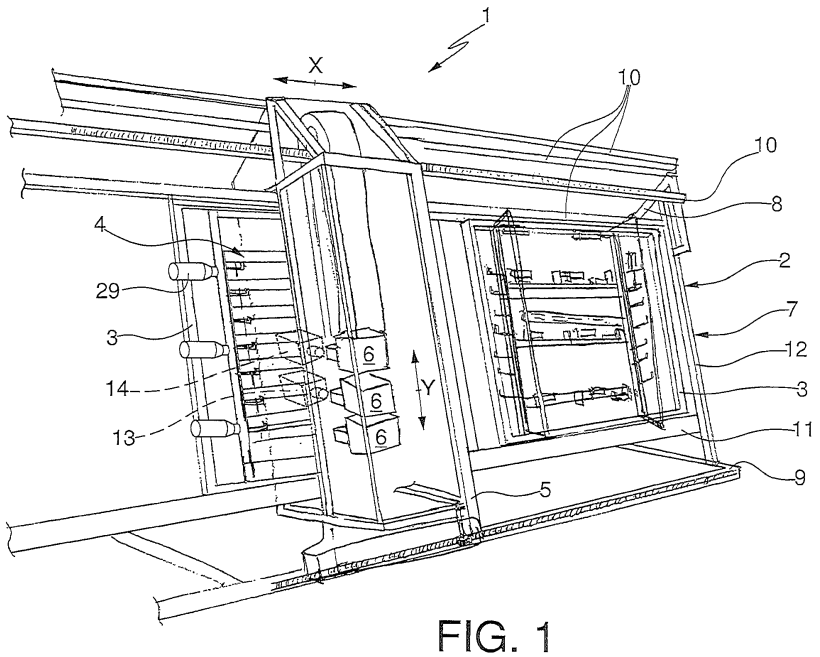

FIG. 1

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a machine for assembling pallets.

[0002] In particular, the present invention relates to some improvements to a semi-automatic machine for assembling pallets that allows a high production of pallets per operator used and a wide operating flexibility as regards the type and dimensions of the pallet to be assembled.

DESCRIPTION OF THE PRIOR ART

[0003] International patent application no. WO2016/185362A1, in the name of the same Applicant, describes a semi-automatic machine for assembling pallets; this machine having various advantages such as operational flexibility and productivity.

[0004] In some types of pallets, in areas where there are strips overlapping cross members or strips overlapping other strips, the use of staples or clips may be required which are closed at the back to confer greater security in the connection between these parts.

[0005] There is therefore the need for a machine which can also create connections between the wood parts overlapping with metallic elements such as staples, clips or the like, the ends of which are closed at the back.

OBJECTS OF THE INVENTION

[0006] One object of the present invention is to improve the state of the art.

[0007] Another object of the present invention is to provide a machine and a method for nailing pallets which allow the use of different types of nails and/or with different nailing methods.

[0008] Yet another object of the present invention is to provide a machine and a method for nailing pallets which allows the realisation of connections between the wood parts overlapping with metallic elements such as staples, clips or the like, the ends of which are closed at the back.

[0009] A further object of the present invention is to provide a machine and a method which allow a rapid assembly of pallets with a high productivity for each operator used.

[0010] These objects are achieved by the machine according to the present invention thanks to at least one front nailing means, at least one corresponding abutment means arranged at the back of the pallet being assembled, as well as at least one further nailing means arranged at the back of the pallet being assembled.

[0011] According to one aspect of the present invention, a machine is presented for assembling pallets according to claim 1.

[0012] According to another aspect of the invention, a method is provided for assembling pallets according to claim 15.

[0013] The machine according to the present invention, having the possibility to move the at least one front nailing means and the at least one rear nailing means vertically and horizontally, manages to obtain a high nailing speed with only two nailing means.

[0014] Another object of the present invention is to provide a machine and a method for assembling pallets that are flexible so that they can be easily adapted to different types of pallets and different types of nailing.

[0015] The adaptation to different types, to different dimensions of pallets, as well as the choice of the type of nailing takes place in a short amount of time thanks to simple adjustment mechanisms.

[0016] Yet another object of the present invention is to provide a machine that is low-cost to manufacture and maintain.

[0017] The machine according to the present invention is constructed in a simple and robust way to allow uninterrupted operation.

[0018] Thanks to the aforementioned simple and robust construction, the machine according to the present invention does not require substantially ordinary maintenance, nor extraordinary maintenance; moreover; all the parts do not require lubrication.

[0019] Further advantageous characteristics are described in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The features of the present invention will be better understood by anyone skilled in the art from the following description and accompanying drawings, provided by way of non-limiting example, in which:

figure 1	is a schematic perspective view of part of the machine for assembling pallets according to the present invention, during operation;
figure 2	is a schematic sectional view of a pallet portion in a nailing step and of part of the machine according to the present invention;
figure 3	is a schematic perspective view of a detail of the machine and of the pallet during a nailing step;
figure 4	is a front view of a machine unit for assembling pallets according to the present invention;
figure 5	is a schematic front view of a part of the unit of the previous figure;
figure 5a	is a schematic perspective view of a detail of the unit of the previous figure;
figure 6	is a schematic perspective view of another detail of the unit of figure 4; and
figures 7 to 13	illustrate a pallet assembling sequence on a machine according to the present invention.

EMBODIMENTS OF THE INVENTION

[0021] In the description that follows, sometimes a machine similar to the one shown in international patent application no. WO2016/185362A1 is referred to, because, for example, the devices disclosed in the present invention can be applied to such a machine; however, these devices can also be applied to any other similar type of machine for assembling pallets.

[0022] Figure 1 shows a machine for assembling pallets, generally designated with the reference number 1, which essentially comprises a support structure 2 within which one or more frameworks 3 can be housed for the assembly of any type of pallet, indicated in figure 1 with the reference number 4.

[0023] The machine 1 further comprises at least one upright 5 movable on the support structure 2 and provided with a plurality of front nailing means 6 and one or more possible rear nailing means 14.

[0024] In the present invention where a component or means is defined as "front", it is intended as acting starting from the front of the machine, i.e. from the side in which it is arranged and an operator acts during the assembly of a pallet, while in the case in which a component or means is defined as "rear", it is intended as acting from the back of the machine, i.e. from the side opposite to that in which it is arranged and an operator acts during the assembly of a pallet.

[0025] The front nailing means 6 are designed to insert nails or staples from a first side or face of a pre-assembled and not nailed pallet, while the rear nailing means 14 are designed to insert nails or staples starting from a second side or the back of a pre-assembled and not nailed pallet. Moreover, the rear nailing means 14 act as a stripe on the opposite side from the front nailing means 6 with respect to a pre-assembled and not nailed pallet. In addition, the rear nailing means 14 act and insert nails or staples in the same line, but in the opposite direction with respect to the front nailing means 6.

[0026] According to the embodiment of figure 1, the support structure 2 of the machine 1 houses two frameworks 3 for the assembly of as many pallets, so while the machine 1 proceeds with the nailing of the parts of a previously pre-assembled pallet on a first framework 3, an operator can prepare the parts of another pallet on a second framework 3.

[0027] According to one version of the present invention (not illustrated), the machine 1 can comprise a number of frameworks 3 even greater than two, for example three or four frameworks 3.

[0028] This can be useful to increase the productivity of the machine using two or more operators to prepare the parts of the respective pallets ready for nailing on the frameworks 3.

[0029] If instead, due to a particular shape of the pallet, or because the nailing means 6, 14 do not allow high speeds and the operation of the nailing means 6, 14 completion of a pallet requires a relatively long time, then, pending completion of the nailing, a single operator can prepare the parts of the pallet also on two or more frameworks 3. The machine 1 is therefore flexible and can be modular with one or more frameworks 3 controlled by a single movable upright 5 with the relative nailing means 6, 14.

[0030] The best productivity is thus obtained from each operator without long waiting times or dead times.

[0031] As shown in figure 1, the upright 5 movable in the direction of the arrow X in the horizontal direction moves back and forth, to see to the nailing of the different parts of the pallets in preparation on the frameworks 3. The nailing direction is transverse or perpendicular to the direction of movement of the movable upright 5.

[0032] The overall size of the machine 1 according to the present invention is contained and in length is slightly greater than the dimensions in length of two pallets arranged side by side; the height dimension of the machine 1 is slightly greater than the height of a pallet arranged vertically while the width dimension is slightly greater than the transverse dimension of a pallet placed vertically and tilted slightly rearwards.

[0033] The machine is thus overall slightly more cumbersome than two pallets, as in the case illustrated in figure 1 with two frameworks 3.

[0034] The support structure 2 comprises a front portion 7 which has the form of a frame inside which the frameworks 3 for assembling pallets are fixed.

[0035] The front portion 7 is inclined slightly rearwards with respect to the vertical, for example with an inclination of about six to ten degrees with respect to the vertical. In essence, the main lying plane of the front portion 7 is inclined with respect to the vertical by six to ten degrees.

[0036] Being inclined rearwards, the back of the front portion 7 rests on support legs 8 for arranging the whole machine 1 on the ground.

[0037] The front portion 7 and the support legs 8 can be connected by a base 9 of rectangular or similar shape. In turn, the base 9 comprises support feet (not shown), of which at least one support foot has a height adjustment to adjust the level of machine 1 on the ground.

[0038] The front portion 7 comprises one or more upper horizontal crossbeams 10, one or more lower horizontal crossbeams 11, and uprights 12 to connect the crossbeams 10, 11. The upper horizontal crossbeams 10 can be realised with H-shaped profiles, the uprights 12 can be of the tubular type, for example with a square or rectangular cross-section, and the lower crossbeams 11 can also have H-shaped profiles.

[0039] Alternatively, all the elements that form the front portion 7 can be tubular elements.

[0040] In any case, the constructive elements that form the support structure 2, including the legs 8 and the base 9, are sized so as to define a very rigid structure.

[0041] The frameworks 3 for assembling pallets can be fixed to the support structure 2 with the same rearward inclination as the front portion 7, the aforementioned rearward inclination with respect to the vertical allows a more

secure support of the parts that the operator will insert from time to time in each framework 3 for composing the pallet 16. If desired, the machine could also comprise only the frameworks 3 inclined rearwards, while the front portion 7 of the machine 1 is in a vertical or otherwise differently inclined position, more inclined or less inclined according to the constructional requirements of the machine 1, as compared to the frameworks 3.

[0042] Thanks to the vertical or substantially vertical position of the frameworks 3, the preparation of the parts of the pallet by the operator is also facilitated. In fact, the operator is located in front of the framework 3 and can easily insert the parts of the pallet in the same frame without having to bend forward over the framework 3 itself. In the following, specific reference will be made to the assembly of a specific pallet 16 with four layers in which, starting from the (upper) support plane of the load on the pallet, there is (see figure 2, with a pallet illustrated only partially, and the subsequent figures 7-13, relative to the operating assembly sequence):

a cover formed by seven strips 161 fixed at three underlying cross members 162 which extend perpendicularly with respect to the strips (first and second layer);
nine blocks 163, that is, three blocks 163 for each of the three cross members 162 (third layer);
three boards 164 that extend parallel to the strips 161 of the cover (fourth layer).

[0043] It must however be considered that the framework 3 can be used for pallets of any shape and components without departing from the scope of the present invention.

[0044] As illustrated in detail in figures 2 and 3, an important feature of the machine 1 according to the present invention is given by the possibility of carrying out nailing which is closed or riveted in the back.

[0045] For this purpose, the movable upright 5 comprises on the back at least one abutment means 13 - see also figure 1 - which moves vertically by means of movement means on a main structure of the movable upright 5 in a coordinated way with the front nailing means 6. The abutment means 13 are responsible for nailing or riveting nails or staples in back inserted by the front nailing means 6 in the parts of a pallet supported by a framework 3.

[0046] As mentioned above, rear nailing means 14 can also be present on the rear part of the movable upright 5 which, in the example illustrated in figure 2, can be used to insert nails or brads 15 of the specific type adapted to penetrate the blocks 163 of the pallet 16. Naturally, the abutment means 13 are staggered or staggerable with respect to the rear nailing means 14.

[0047] The upright 5 further comprises vertical movement means (not shown), to vertically move the at least one front nailing means 6, the at least one abutment means 13, the at least one rear nailing means 14 according to the direction indicated by the arrow Y shown in figure 1.

[0048] The above-mentioned vertical movement means can vertically move the front nailing means 6 all together, if there is more than one front nailing means 6, or each front nailing means 6 can be moved independently by a respective vertical movement means. When a nailing must be closed or riveted in the back, the vertical movement means move the at least one abutment means 13 in a coordinated manner with the respective front nailing means 6.

[0049] Figure 3 shows in detail one abutment means 13 which comprises a support 17 which is movable in two positions: an abutment and a release position for the pallet 16.

[0050] In the abutment position, the support 17 acts as an abutment, when a staple 18 - or a nail or a brad - is inserted which must be riveted or closed at the back, closing it at the back of the pallet.

[0051] According to one version of the present invention, the support 17 is movable in both directions as indicated by the arrows F, according to a direction substantially parallel to the direction of introduction of the staple 18, or nail or brad. In this case, a front nailing means 6 and a respective abutment means 13 would be or would act substantially along the same direction, which will preferably be substantially inclined with respect to the vertical and perpendicular to the main lying plane of a framework 3 or of the pallet 16 to be assembled.

[0052] According to another version of the present invention, the support 17 can be movable in another direction transverse or orthogonal to that of the respective front nailing means 6, for example laterally.

[0053] The abutment means 13 comprise a movement device 19 which allows, according to the arrows F, the support 17 to be pulled out or retracted.

[0054] When the support 17 is in the pulled out position, the movement device 19 develops a force sufficient to counteract the bending and/or closing force of the staple 18 (or nail or brad) applied and/or due to the actuation of the nailing means 6.

[0055] A locking mechanism (not shown) can also be provided that allows locking said support element 17 in the pulled out and/or retracted position.

[0056] In particular, when the support 17 is in the pulled out position, the locking mechanism of the movement device 19 allows the support 17 to sustain the bending and/or closing force of the staple 18 due to the actuation of the nailing means 6.

[0057] The support 17 has an abutment face 20 that can be substantially flat or can have one or more inclined grooves (not shown) to facilitate the bending and/or closing of the staple 18, or nail or brad.

[0058] During operation, the support 17 can be pulled out substantially at the same time as the actuation of the nailing means 6, or slightly before the actuation of the nailing means 6 to also support the parts of the pallet 16 affected by the nailing.

[0059] Due to the presence of the abutment means 13 arranged behind the pallet 16, the framework 3 for assembling pallets 16 must have particularly limited footprint features to allow the abutment means 13 to fit through the framework 3 itself.

[0060] Furthermore, multiple adjustment possibilities are provided in the framework 3 for quick adaptation to different types of pallets without the need to replace parts of the framework 3 itself.

[0061] Naturally, the framework 3 with the characteristics that will be described below can also be applied to a machine without abutment means 13, for example, a machine such as that illustrated in the international patent application no. WO2016/185362A1. Figure 4 shows a framework 3 for assembling pallets according to the present invention.

[0062] Framework 3 comprises a frame 21, formed for example by horizontal elements or tubular horizontal elements 22 and vertical elements or tubular vertical elements 23 connected to each other for example in a substantially rectangular shape, and the transverse groups 24 that are arranged substantially horizontally and are adjustable in the vertical direction because, as will be seen in more detail below, during the formation of the specific pallet 16, they are needed for supporting the boards 164 and for supporting the blocks 163.

[0063] It should be noted that the number and the position of the transverse groups 24 is a consequence of the number of boards 164 of the pallet 16, so if the number of boards 164 is greater than three, the number of transverse groups 24 should be in equal number to that of the boards 164, that is, greater than three; similar considerations can also be made for the other parts of the pallet 16, such as the blocks 163, the cross members 162 and the strips 161.

[0064] A vertical guide 25 and a rack 26 are arranged on each tubular vertical element 23; the transverse groups 24 have, at their ends, blocks sliding on the vertical guides 25 and two first toothed wheels 27, each of which being engaged on a rack 26; the two toothed wheels 27 are connected to each other by a first shaft 28; the two toothed wheels 27 are placed in rotation by a gearmotor 29.

[0065] By maintaining a substantially horizontal orientation, the position of the transverse groups 24 is therefore adjustable in height by means of the simultaneous rotation of the two toothed wheels 27 which are engaged on the two racks 26.

[0066] Furthermore, since the gearmotor 29 can be provided with an automatic brake, for example of the electromagnetic type, once the vertical position of the transverse group 24 necessary for the formation of the pallet 16 has been reached, this position is maintained by the automatic locking of the gearmotor 29 brake.

[0067] Each transverse group 24 also comprises a bracket 30, provided with substantially vertical rear supports 31. In the example illustrated in figure 4 there are two supports 31 for each bracket 30, supports 31 allow positioning the boards 164 on the brackets 30 with sufficient security without the boards 164 risking falling at the back.

[0068] In front of the bracket 30, the transverse group 24 comprises supports 32 for the blocks 163, in the example of the pallet illustrated in the figures there are three blocks 163 for each board 164, that is, nine blocks 163, accordingly there are three supports 32 for each transverse group 24, that is, in total there are nine supports 32.

[0069] The supports 32 are arranged in the same position as the blocks 163 and are fixed to a horizontal beam 33 movable in a vertical direction via a series of actuators 34 and in particular, each beam 33 is connected to two actuators 34 arranged near the ends of the beam 33 itself, these actuators 34 can raise or lower the beam 33, with the supports 32, by a few centimetres.

[0070] To obtain a synchronised movement of the two ends of the beam 33, two synchronisation mechanisms 35 are provided, arranged at the two ends of the beam 33.

[0071] As is also more clearly apparent from the detail of figures 5 and 6, each synchronisation mechanism 35 comprises a rack section 36, arranged vertically and fixed to a supporting framework 37 of the transverse group 24, the actuator 34 also being fixed to this framework 37, and a second toothed wheel 38 which is in turn arranged on and fixed to a second connecting shaft 39 for the two synchronisation mechanisms 35 arranged at the ends of the beam 33; the shaft 39 is inserted on two supports 40, for example, two rolling bearings, fixed to the beam 33, the aforesaid supports 40 allowing the rotation of the shaft 39.

[0072] Each rack 36 is therefore locally fixed because it is connected to the supporting framework 37 of the transverse group 24, while the toothed wheels 38 with the shaft 39 and the supports 40 are connected to the beam 33, which is lifted and lowered as controlled by the actuators 34.

[0073] Front-back adjustment means 41 are also provided for adjusting the bracket 30 with the supports 31 according to a front-back direction.

[0074] This adjustment serves to adapt the framework 3, with the relative supports and rests, to pallets of different thicknesses or different transverse dimensions; "front-back direction" means a direction transverse or orthogonal to a vertical direction, in use, as well as transverse or orthogonal to a direction from one side to the other of the framework 3 or to the direction X of movement of the movable upright 5.

[0075] According to the non-limiting example embodiment shown in the figures, the front-back adjustment means 41 comprise two rack components 42 connected to the bracket 30, for example delimited at one end, for example a lower end of a plate 43, for example arranged with a vertical arrangement, by a first face 43a from which the bracket 30 extends.

[0076] The front-back adjustment means 41 also comprise two toothed wheel elements 44, each of which engages a respective rack component 42; the toothed

wheel elements 44 are then connected or mounted or keyed, in phase with each other, on a third shaft 45, which is in turn mounted to be locally fixed to the framework 3, but in a rotatable manner.

[0077] With such a structure, by moving the front-back position of the bracket 30, it causes a movement of the rack components 42 connected to the plates 43 (to the right and left), and thus the rotation of the shaft 45 with the toothed wheel elements 44 which engage the rack components 42.

[0078] A movement of the same extent towards the front or towards the back of both the plates 43 (to the right and left) that support the brackets 30 is thus obtained.

[0079] In practice, by adjusting the front-back position of the bracket 30, the same movement to the right and left of the plates 43 is always obtained, and therefore the bracket 30 always moves parallel to itself.

[0080] On a second face of each plate 43, means for guiding or directing the movement of the bracket 30 extend, for example a block 45 slidably mounted on a rib or raised element 46 in turn fixed to or emerging from the framework 37.

[0081] To lock the front-back position of each plate 43 and therefore of the bracket 30, a bolt 47 or similar locking means are provided, this bolt 47 can be present on both plates 43, or on a single plate.

[0082] Naturally, the adjustment of the front-back position of the bracket 30 could also be carried out with different adjusting means, adjusting means which themselves must maintain a corresponding and coordinated movement of the ends of the bracket 30, namely the plates 43 which support the bracket 30.

[0083] With a machine according to the present invention, initially the position of the transverse groups 24 is suitably set or adjusted, or better is set or adjusted depending on the type, size, thickness, etc. of the pallet to be obtained, through the respective gearmotors 29 and the position of the brackets 30 is set or adjusted by means of the actuation of the front-back adjustment means 41.

[0084] In this initial step, see figure 7, the beam or beams 33 with the supports 32 is/are in the lowered position to allow the operator to more easily place the boards 164 on the respective brackets 30, then upon the command of the operator, the actuators 34 lift the beam 33 (see figure 8).

[0085] Clearly, when the pallet is completed, a command would be executed that will return the beam 33 to the lowered position in order to allow removing the pallet from the framework 3.

[0086] Each of the supports 32 for the blocks 163 comprises two side walls 32a, 32b thus constituting a seat and a positioning for each block 163.

[0087] A first side wall 32a is fixed, having the function as reference for the position of the block 163, while the second side wall 32b is movable by means of a respective actuator 32c, so as to stop the block 163 in a predetermined position as a function of the pallet that is being prepared.

[0088] The wall 32b can be found in two positions: a first position in which the seat is wider, to allow easy insertion of a block 163 by the operator and a closed position, in which the wall 32a rests on block 163 for which the position is determined with precision.

[0089] The wall 32b is actuated, on the command of the operator, by means of the respective actuator 32c, which for example can be realised with a double-acting pneumatic cylinder, but of course it can also be any other type of actuator adapted to the purpose. Figure 9 shows a pallet preparation step in which the operator has already placed the blocks 163 on the supports 32 in front of the boards 164, and the movable walls 32b are in the position in which the seat is wider; figure 10 shows the walls 32b closed and leaning against the blocks 163, so as to precisely define their position.

[0090] The position of the block 163 is therefore defined by the position of the walls 32a and the subsequent movement of the wall 32b which puts the block 163 into contact with the wall 32a. Depending on the geometry of the pallet being assembled, the position can be adjusted and the number of seats for the blocks 163 can also be varied.

[0091] Each group formed by the support 32, the side walls 32a, 32b and the actuator 32c can be added to or removed from the beam 33, and the position of the group can also be adjusted in the longitudinal direction with respect to the beam 33 to accommodate different types and sizes of pallets.

[0092] When the pallet is completed, a release command will be executed that will move the walls 32b in the position in which the seat is wider by freeing the blocks 163 to allow removing the pallet from the framework 3.

[0093] Figure 11 shows a further step of preparation of the parts of the pallet 16; in this step, the operator inserts the cross members 162 that are supported vertically on three supports 32 further down, for this purpose the supports 32 in the lowest position are provided longer in order to allow the positioning and support of the cross members 162 in front of the blocks 163.

[0094] In a later step, the operator moves, in front of the cross members 162, the supports 48 which serve to support the strips 161 that will form the cover of the pallet 16.

[0095] As can also be seen in figure 4, the supports 48 are arranged at the sides of the pallet that is being formed, and on each side the support group 48 is attached to a fourth rotatable vertical shaft 49 which is connected to a respective actuator 50.

[0096] In the specific case the actuator 50 is of the linear type and actuates the rotation of the shaft 49 via a crank and connecting rod mechanism.

[0097] Naturally, rotary actuators could also be used to rotate the shaft 49, for example a gearmotor.

[0098] It should also be noted that the movement of the supports 48 in front of the cross members 162, which in the embodiment illustrated in the figures takes place

with a rotation, could be obtained in a different way, for example with a translation of the supports 48, which are initially located at the sides and outside the footprint of the pallet being prepared, and would then be translated in front of the cross members 162, in the latter case the shaft 49 which carries the supports 48 would be translatable transversely instead of rotating.

[0099] The number and position of the supports 48 are determined by the number and position of the strips 161, and therefore the supports 48 can be added or removed from the shaft 49 and can also be adjusted in height.

[0100] In a subsequent step, illustrated in figure 12, the operator rests the strips 161 on each support 48. The support 48 comprises at a first end an adjustable coupling 48a to the shaft 49, an arm 48b, and at the second end a small support plane 48c (see figure 7) for a strip 161.

[0101] Therefore, once the supports 48 are placed in the working position, the operator can quickly and easily put all seven strips 161, or the number of strips provided for the pallet being formed, on the support planes 48c of the supports 48.

[0102] Also in this case, when the pallet is completed, a command will be executed that will return the supports 48 outside the footprint of the pallet to allow removing the pallet from the framework 3.

[0103] Figure 13 shows the last preparation step of the pallet 16. In this step, the operator closes two leaves 51 above the pallet, which each have a vertical bar 52 which rests above the strips 161, exerting a moderate pressure by means of elastic return means (not shown) acting on the leaves 51.

[0104] In this way, the leaves 51 ensure that the parts of the pallet, in particular the strips 161 which have not yet been nailed, remain in the desired position for the subsequent nailing operation.

[0105] It should be noted that, for safety reasons, the closing of the leaves 51 can also provide a gating for the subsequent nailing operation. In other words, without the closing of the leaves 51 it is not possible to carry out the nailing and the movable upright 3 does not move.

[0106] After the preparation of the pallet on one of the frameworks 3 is completed, the operator can control the nailing of the pallet which occurs in a completely automatic way, and can simultaneously move to another of the frameworks 3 to prepare another pallet.

[0107] The pallet nailing operation is carried out by the nailing means 6 and 14 that are carried by the movable upright 3, also suitably actuating the abutment means 13, so that the latter move on the movable upright 5 in a coordinated way with the respective front nailing means 6.

[0108] The movable upright 3 is supported in a sliding manner and can move horizontally with respect to the support structure 2.

[0109] In particular, motor means are provided which allow a horizontal lateral movement in the two directions of the movable upright 3, as indicated by the arrow X in figure 1.

[0110] As will be appreciated, thanks in particular to the presence of abutment means, it is possible to rivet, at the back, a staple 18 - or a nail or a brad, which has been inserted by nailing means 6.

[0111] This ensures the realisation of connections between the wooden parts overlapping with metallic elements such as staples, clips, or the like, whose ends are closed in the back, improving the bond of the pallet components and ensuring the absence of dangerous points protruding from the pallets at the end of the realisation of the same.

[0112] Moreover, a machine according to the present invention has movement components such as to ensure high versatility and adaptability to the realisation of even very different pallets.

[0113] It has thus been seen how the invention achieves the intended purposes.

[0114] The present invention has been described according to preferred embodiments, but equivalent variants are still possible without departing from the scope of the appended claims.

Claims

1. Machine (1) for assembling pallets comprising a support structure (2), at least one framework (3) for assembling a pallet (16), said pallet (16) being formed of parts (161-164), said framework (3) being housable within said support structure (2), at least one upright (5) movable on said support structure (2) and provided with at least one front nailing means (6) for nailing the parts (161-164) of the pallet (16), said machine further comprising means of vertical movement for vertically displacing said at least one front nailing means (6) on the movable upright (5), said movable upright (5) comprises on the rear part at least one abutment means (13), said at least one abutment means (13) being designed to close or rivet the nails or staples at the back inserted by said front nailing means (6) into the parts of a pallet (16) supported by said at least one framework (3), **characterised in that** said at least one abutment means (13) is vertically movable by means of said movement means in a coordinated manner with the respective one or more front nailing means (6).

2. Machine according to claim 1, wherein said at least one abutment means (13) comprises a support (17) which is movable in two positions, i.e. an abutment and a release one for the pallet (16), in the abutment position, the support (17) acting as an abutment when a staple or nail or a brad (18) is inserted which must be riveted at the back, closing it on the back of the pallet and in which said abutment means (13) comprises a movement device (19) which allows the support (17) to be pulled out or folded in, so that when the support (17) is in its pulled out position,

said movement device (19) develops a force sufficient to counteract the bending and/or closing force of the staple or nail or brad (18) applied to the actuation of the front nailing means (6).

3. Machine according to claim 2, wherein said support (17) is movable in both directions according to a direction substantially parallel to the direction of introduction of the staple or nail or brad (18) by a front nailing means (6).

4. Machine according to claim 2, wherein said support (17) is movable in both directions according to an orthogonal or transverse direction to the direction of introduction of the staple or nail or brad (18) by a front nailing means (6).

5. Machine according to claim 2, 3 or 4, wherein said support (17) has an abutment face (20) that can be substantially flat or may have one or more inclined grooves to facilitate bending and/or closing of the staple or nail or brad (18).

6. Machine according to any of the preceding claims, wherein said at least one framework (3) comprises a frame (21) formed by horizontal elements (22) and vertical elements (23) connected to each other, and then comprises transverse groups (24) which are arranged substantially horizontally and are vertically adjustable along said vertical elements (23), on each vertical element (23) a vertical guide (25) being arranged, as well as a rack (26), whereas the transverse groups (24) have at their ends blocks sliding on the vertical guides (25) and two first toothed wheels (27), each of which engages on a rack (26), said first toothed wheels (27) being connected to each other by a first shaft (28) and engaged in rotation by means of a gearmotor (29).

7. Machine according to claim 6, wherein said gearmotor (29) is provided with an automatic brake, for example of the electromagnetic type, so that once the vertical position of the transverse group (24) necessary for the formation of the pallet (16) has been reached, this position is maintained by the automatic locking of the gearmotor (29) brake.

8. Machine according to claim 6 or 7, wherein each transverse group (24) comprises a bracket (30) provided with substantially vertical rear supports (31) and in which frontally to the bracket (30) each transverse group (24) comprises supports (32), said supports (32) being fixed to a horizontal beam (33) movable in a vertical direction via a set of actuators (34).

9. Machine according to claim 8, comprising synchronisation mechanisms (35) arranged at the two ends of the beam (33), to obtain synchronised movement of the two ends of the beam (33).

10. Machine according to claim 9, wherein each synchronisation mechanism (35) comprises a rack section (36), arranged vertically and fixed to a supporting framework (37) of a transverse group (24), and a second toothed wheel (38) which is in turn arranged on and fixed to a second connecting shaft (39) for the two synchronisation mechanisms (35) arranged at the ends of the beam (33), said second shaft (39) being inserted on two supports (40) fixed to the beam (33), said supports (40) allowing for the rotation of the second shaft (39), each rack (36) being therefore locally fixed because it is connected to the support framework (37) of the transverse group (24), while the second toothed wheel (38) with the second shaft (39) and the supports (40) are connected to the beam (33) which is lifted and lowered as controlled by the actuators (34).

11. Machine according to any one of claims 8 to 10 when dependent on claim 8, comprises adjustment means (41) in the front-back direction of the bracket (30) with the supports (31).

12. Machine according to claim 11, wherein said front-rear adjustment means (41) comprise two rack components (42), each component being connected to a respective end (43) of the bracket (30), two toothed wheel elements (44), each of which engages on a respective rack component (42), said toothed wheel elements (44) being connected or mounted or keyed, in phase with each other, at the ends of a third shaft (45), in turn mounted to be locally fixed and rotatable on said at least one framework (3).

13. Machine according to any of the preceding claims, wherein said movable upright (5) comprises on its rear part at least one rear nailing means (14) which can be moved vertically by means of said vertical movement means on a main structure of the mobile upright (5).

14. Machine according to any one of the preceding claims, wherein said at least one framework (3) has a rearward inclination with respect to the vertical, providing safe supporting of the parts of the pallet to be assembled.

15. Method for assembling a pallet formed by parts, said parts being strips (161), blocks (163), which constitute the intermediate part of the pallet, cross members (162) and boards (164), comprising the steps of:

preparing a machine according to any one of the preceding claims,
preparing the parts (161-164) of the pallet (16) on said at least one framework (3) for assembly,

nailing the parts of the pallet (16) prepared on the at least one framework (3) by means of said at least one front nailing means (6),
characterised in that
said at least one abutment means (13) closes or rivets at the rear the nails or staples inserted by said at least one front nailing means (6).

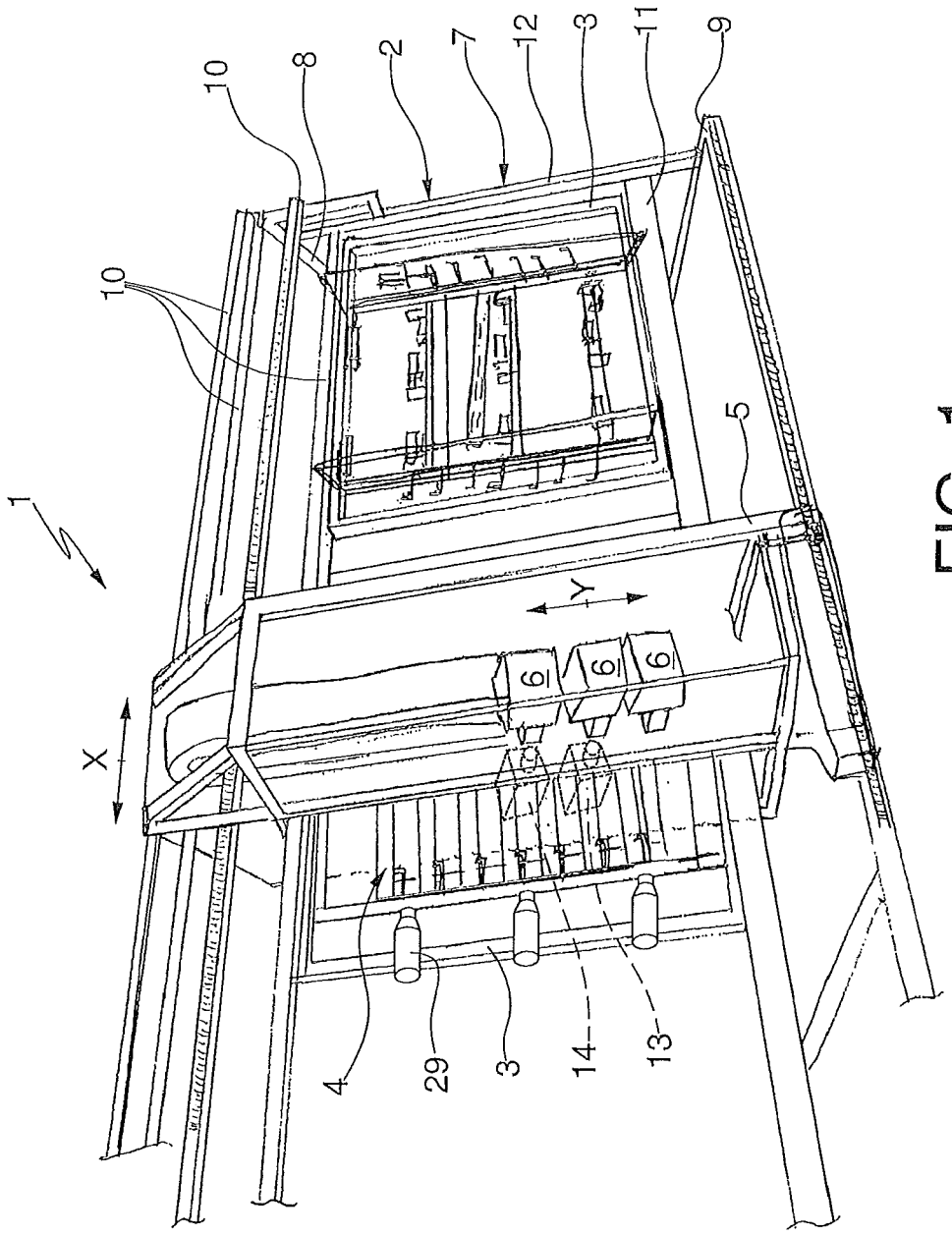

FIG. 1

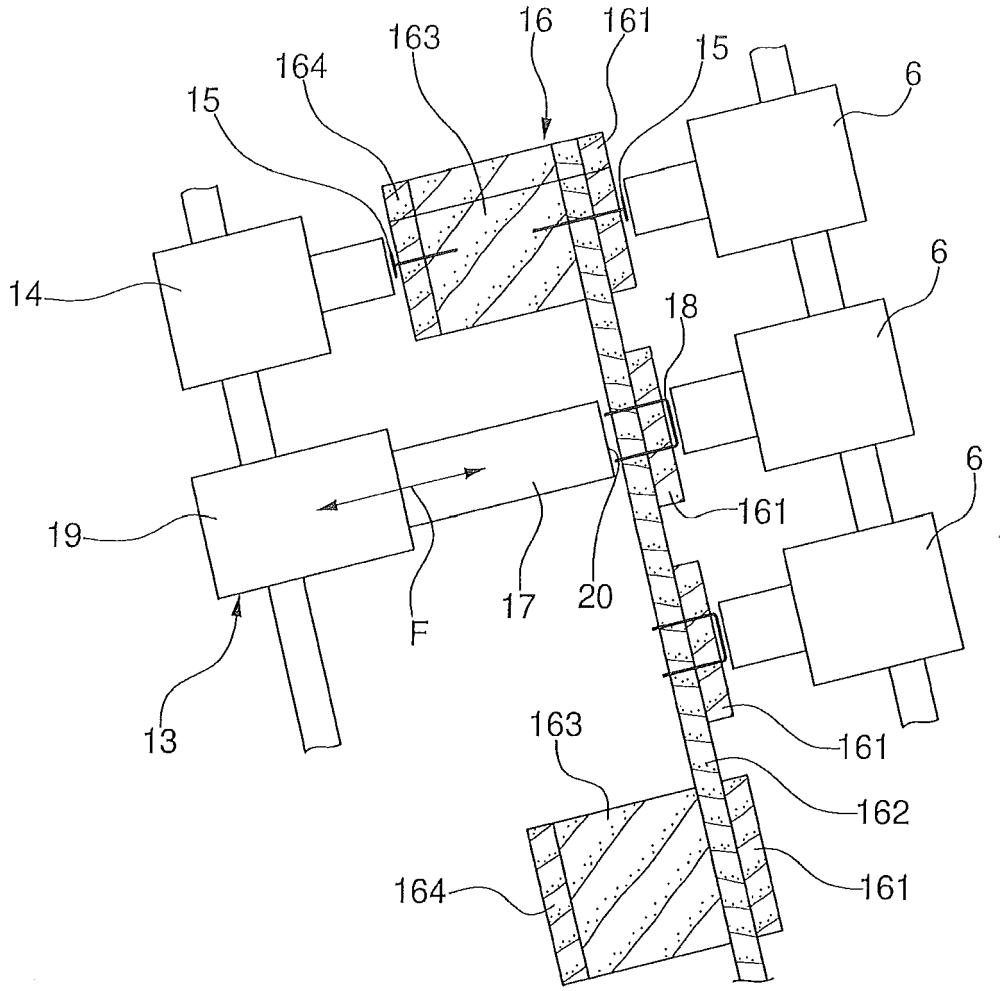
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FIG. 2

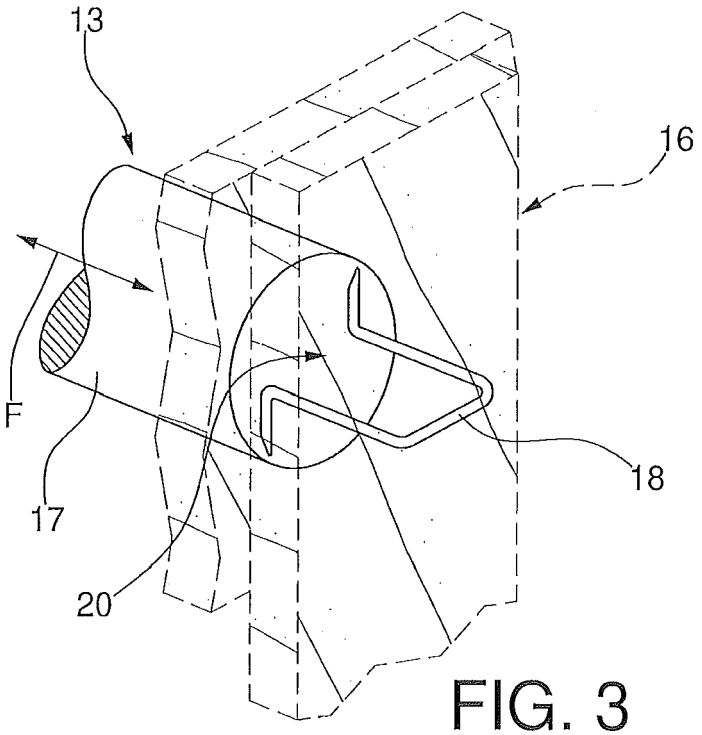
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FIG. 3

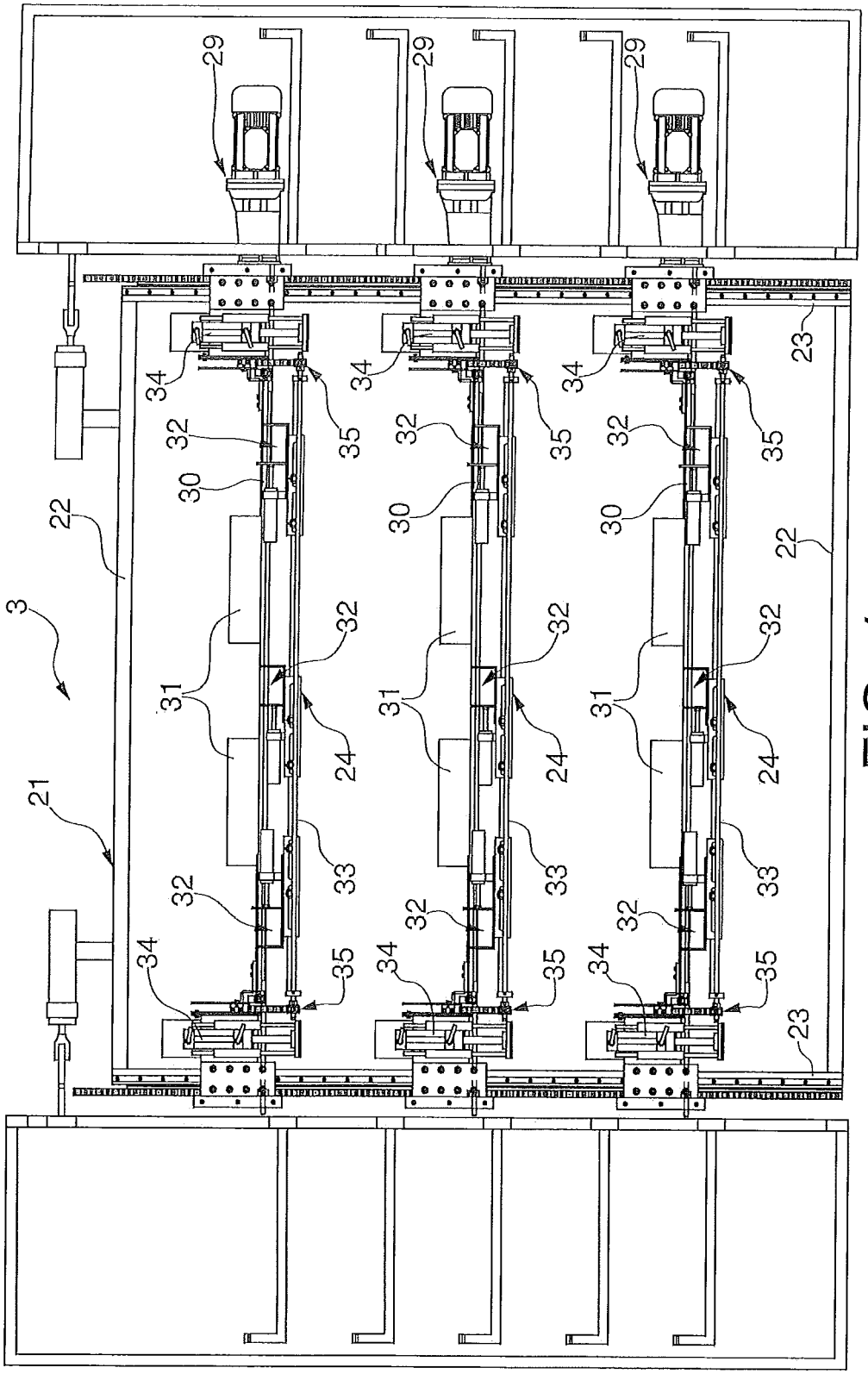
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FIG. 4

FIG. 5a

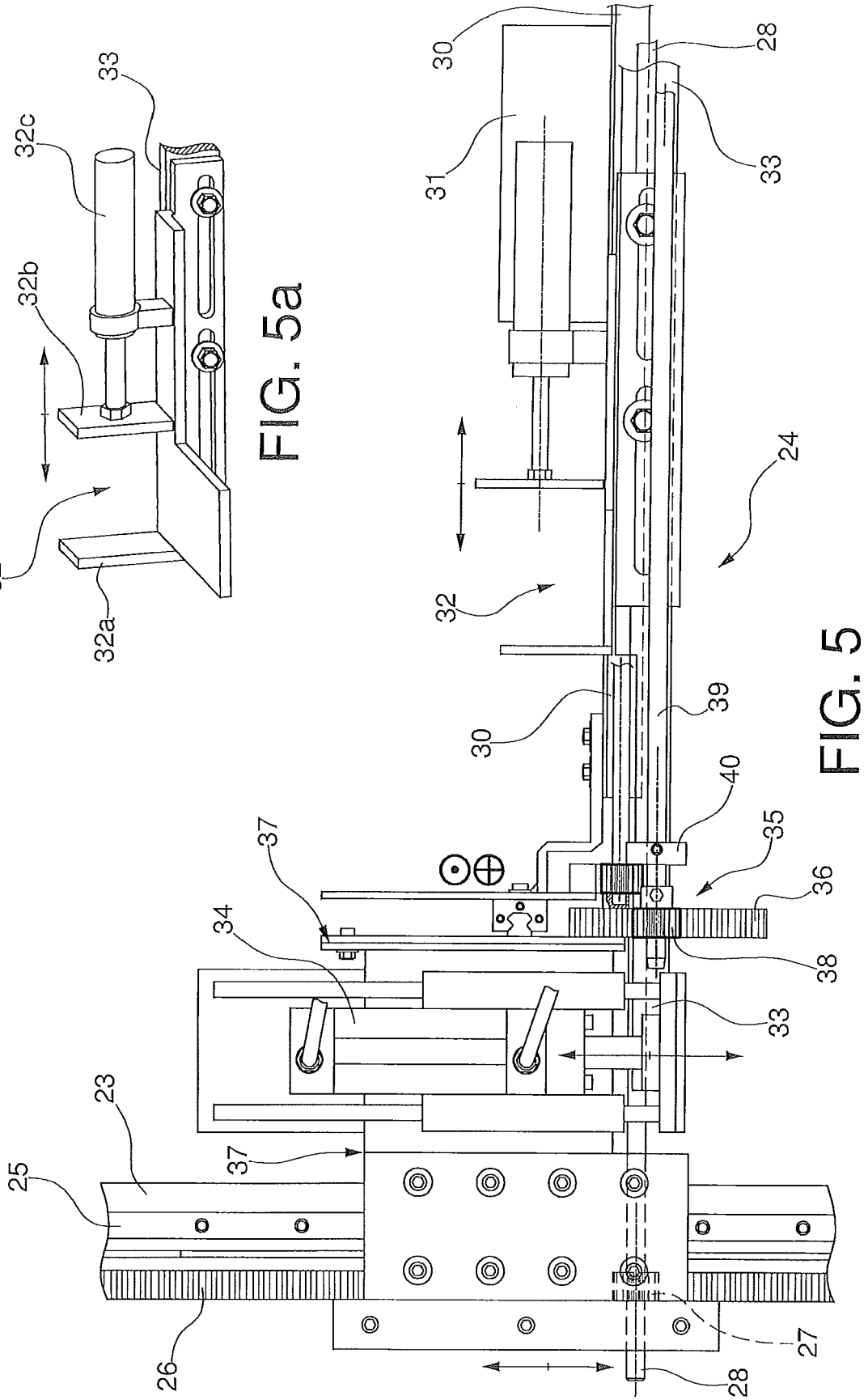

FIG. 5

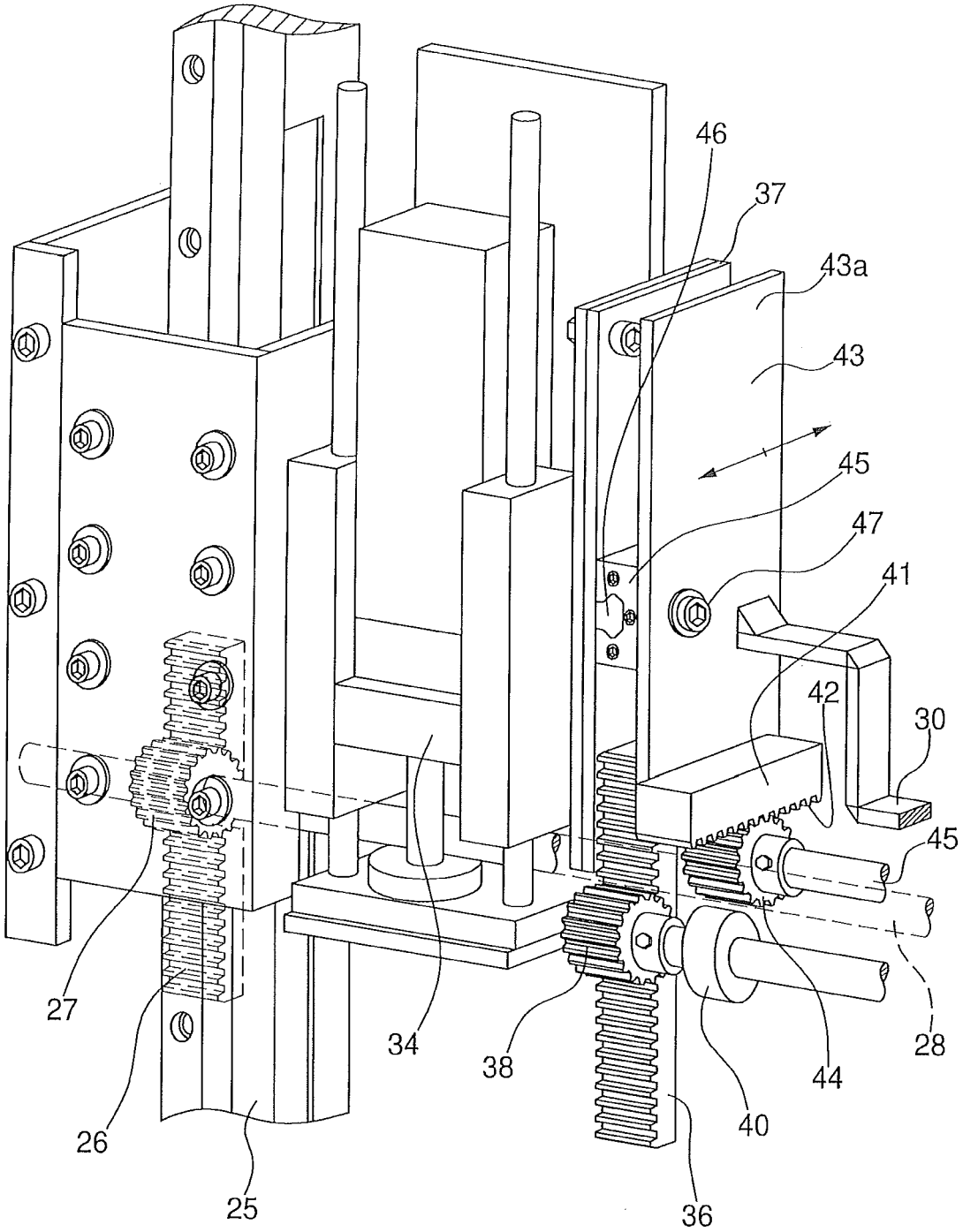

FIG. 6

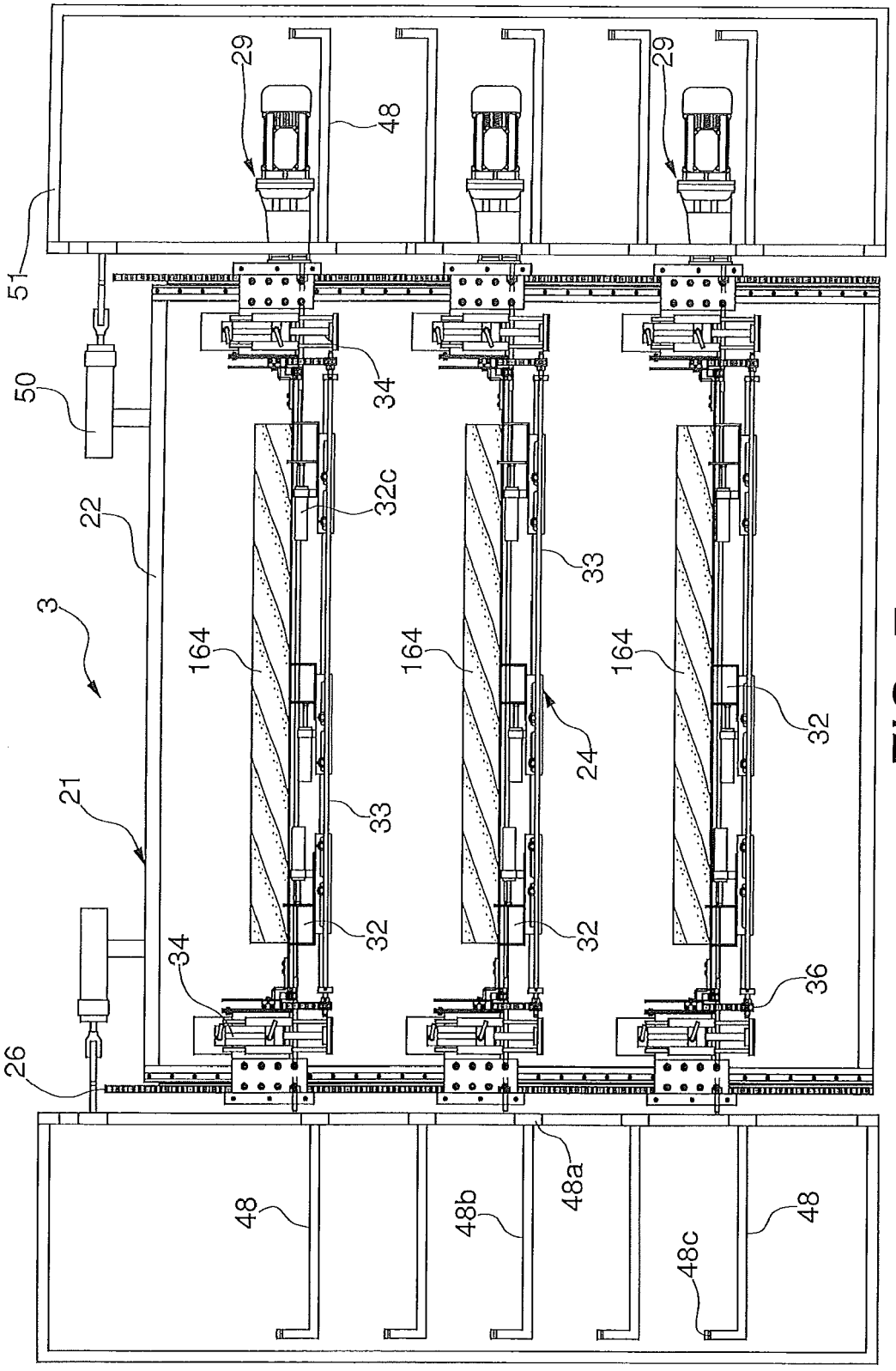
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FIG. 7

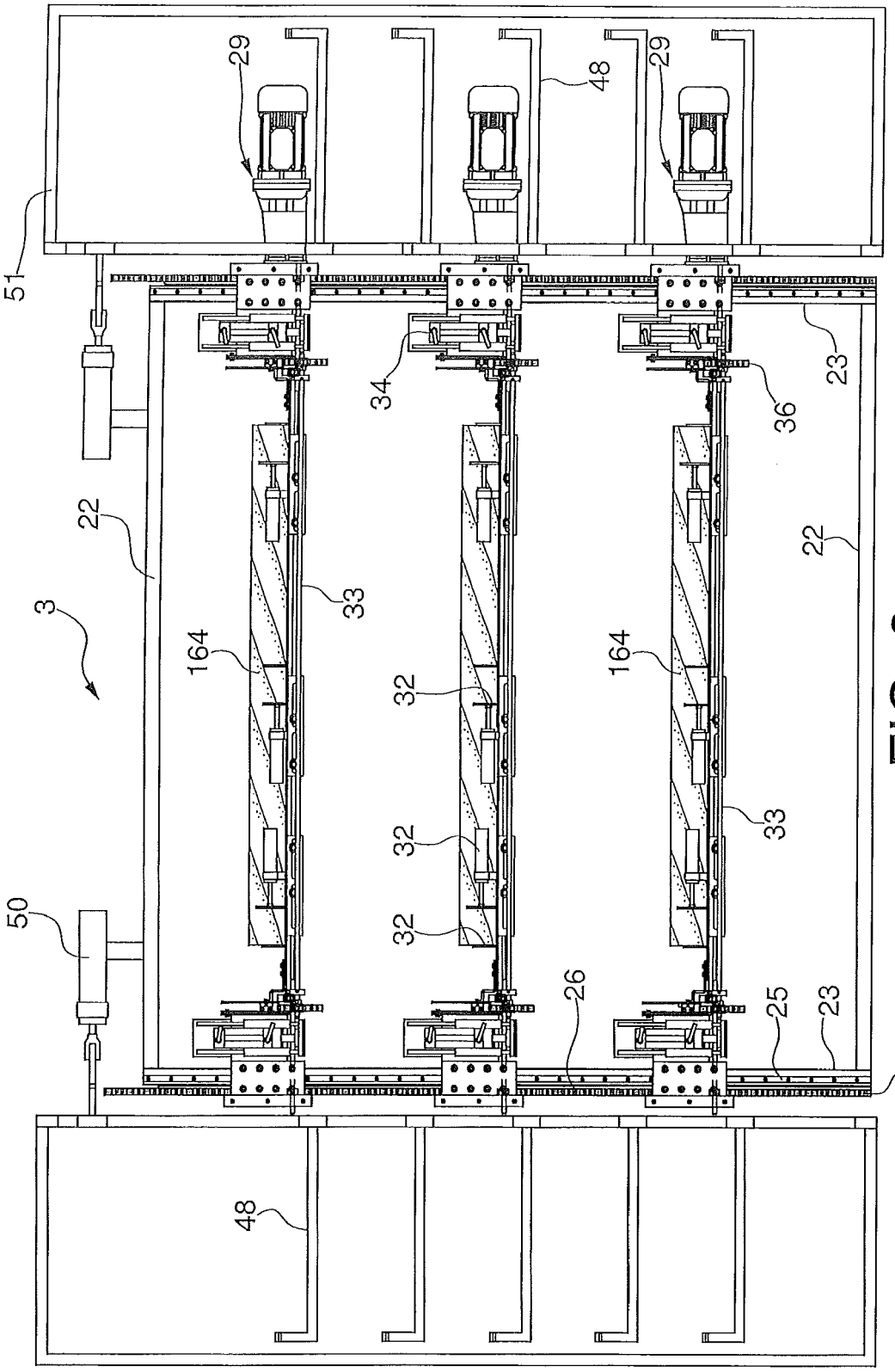
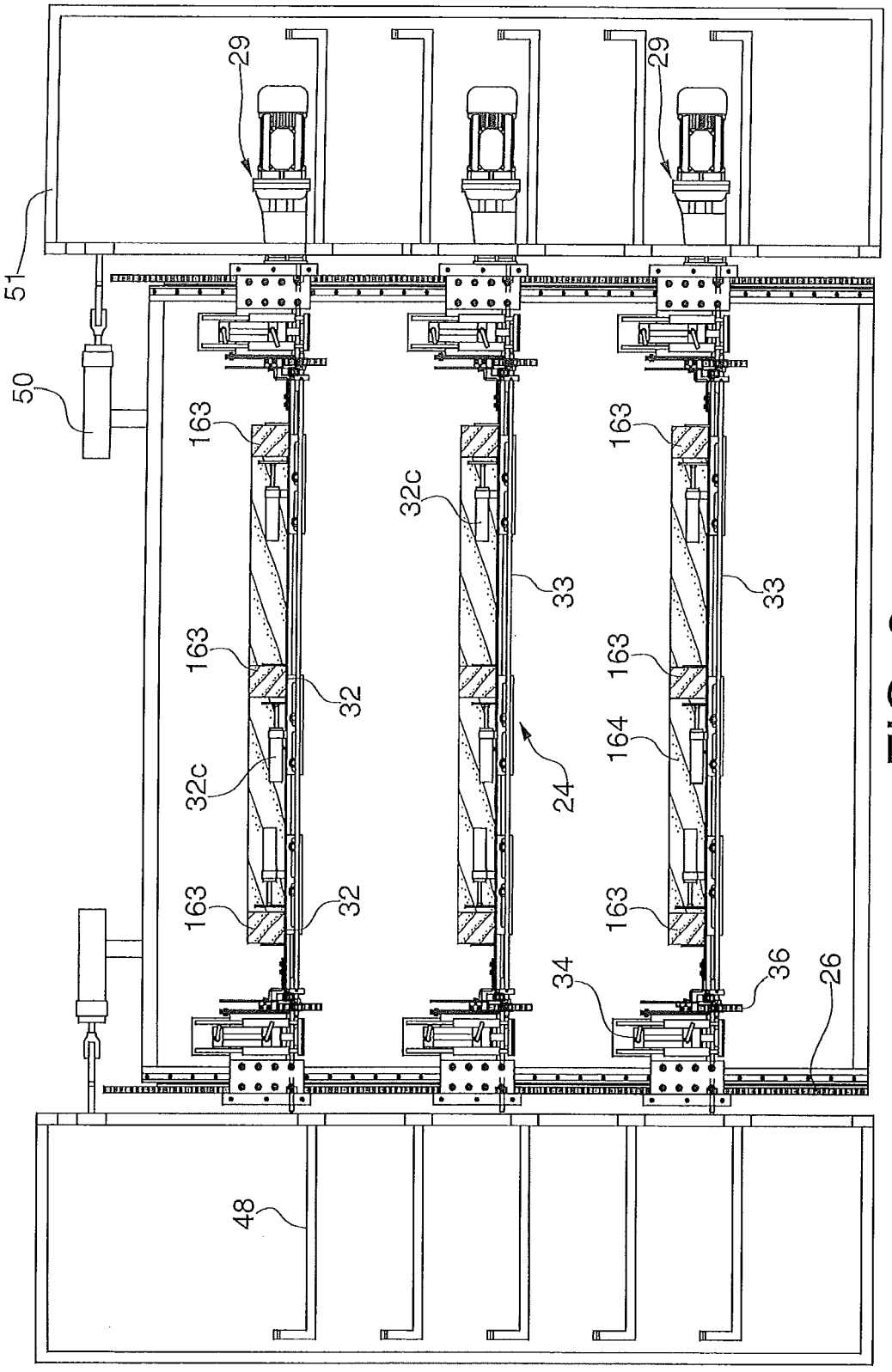


FIG. 8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32c
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FIG. 9

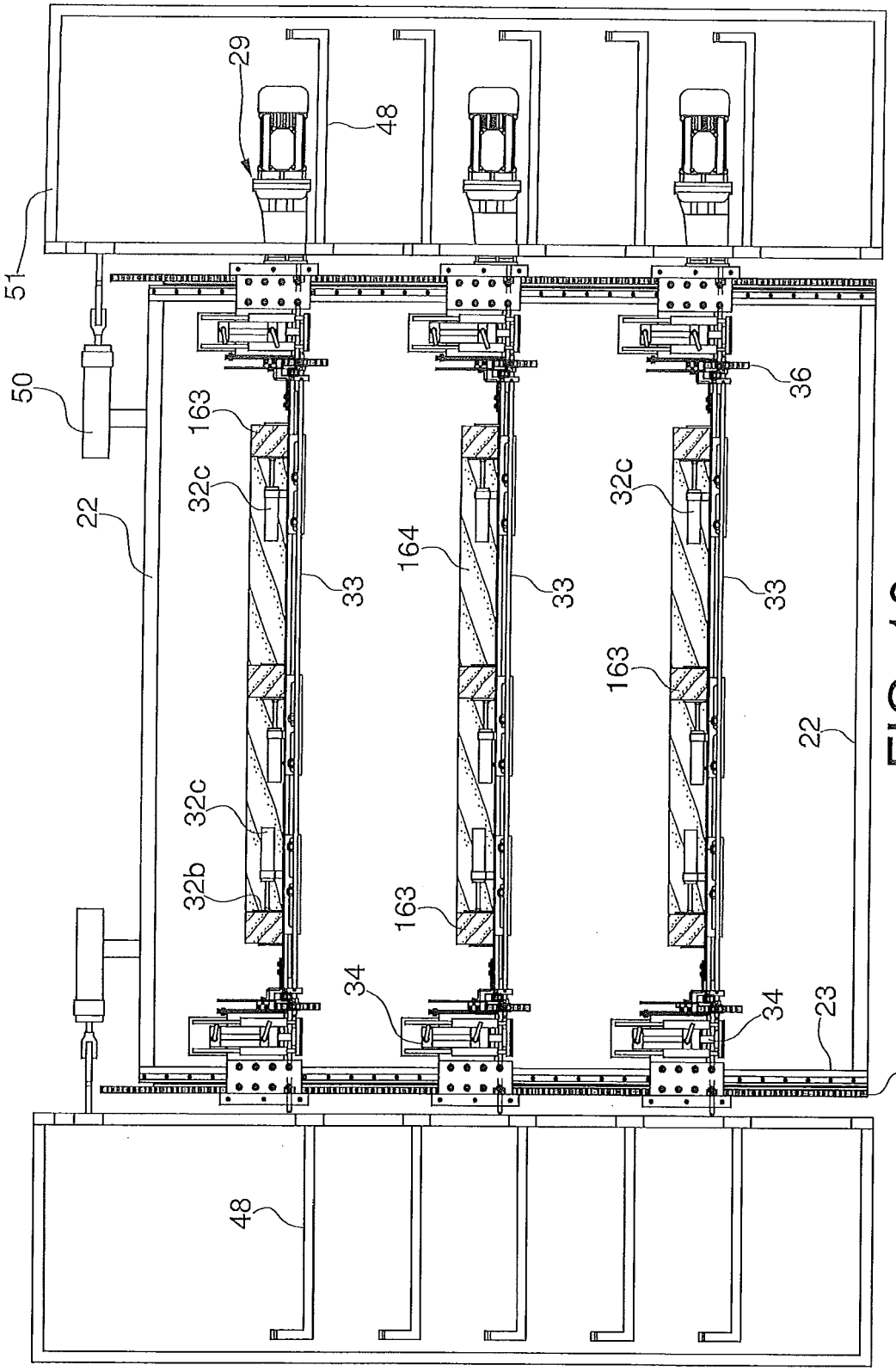

FIG. 10

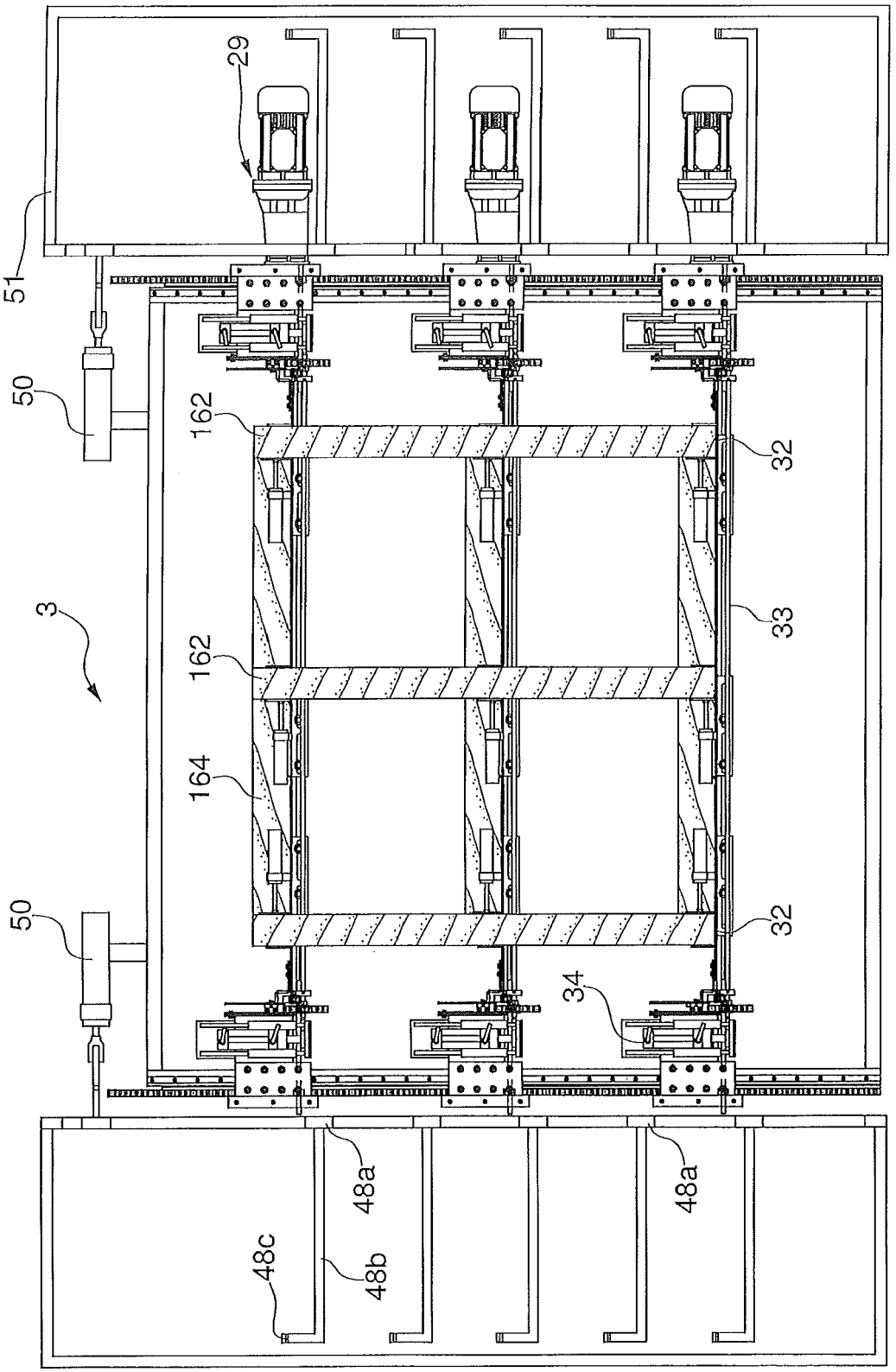

FIG. 11

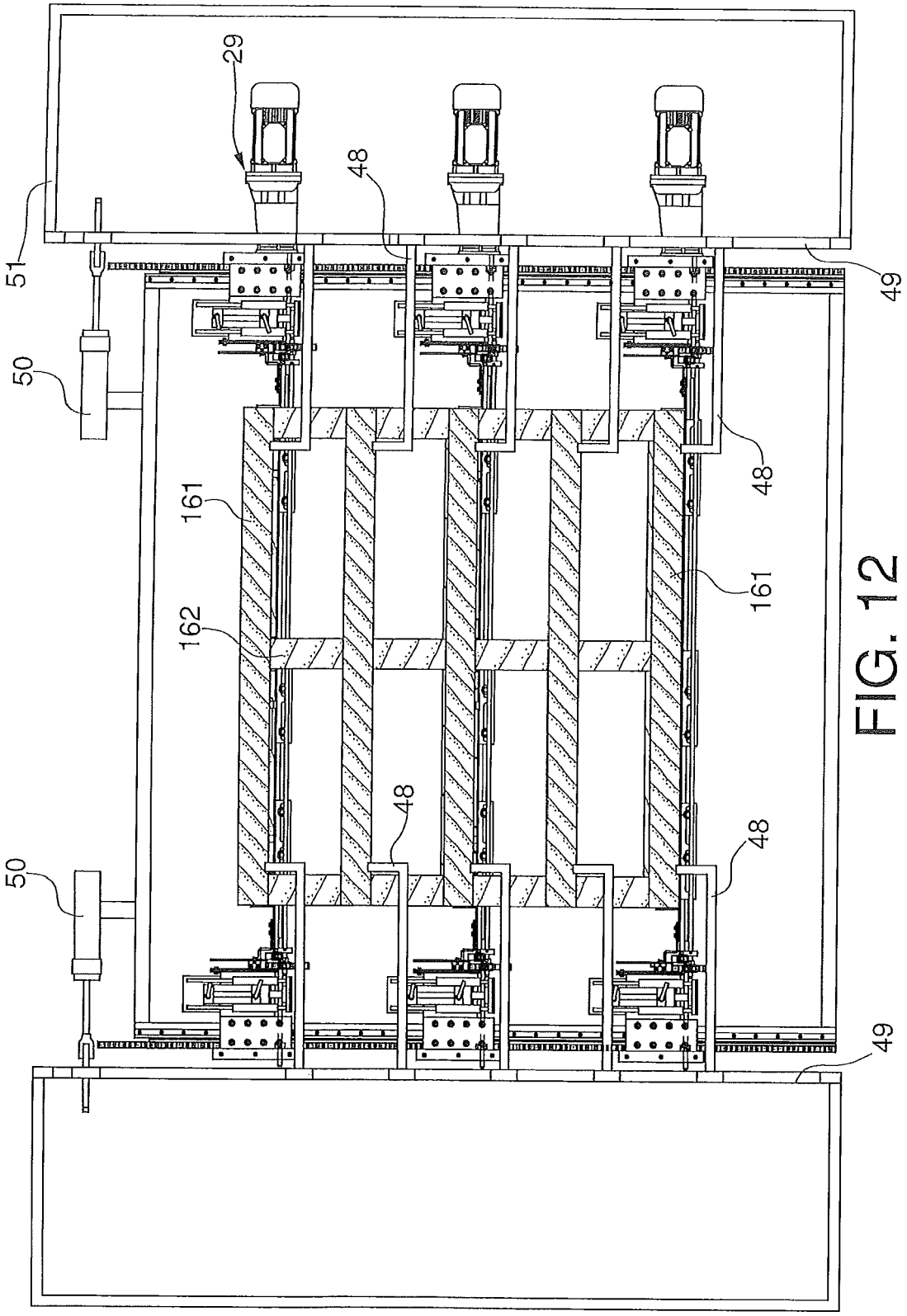

FIG. 12

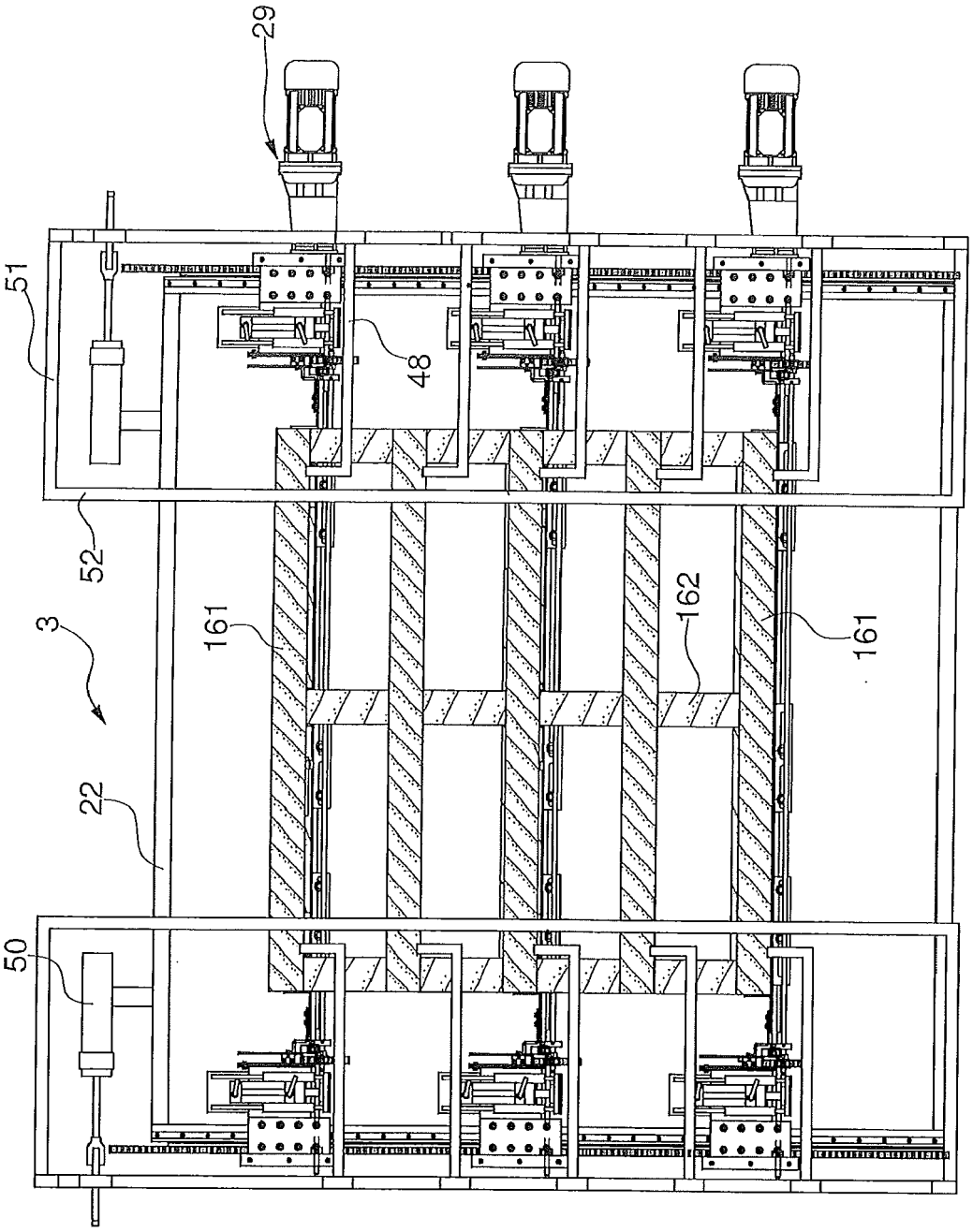

FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 19 19 7130

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A	GB 1 564 505 A (WHITFIELD WYLIE LTD) 10 April 1980 (1980-04-10) * page 2, line 84 - line 91; figure 2 *	1,15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 December 2019	Huggins, Jonathan

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18-12-2019

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