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(54) Rounding and trimming group for edges of panels

(57) The present invention relates to a rounding and trimming group, formed by two rounding and/or trimming assemblies (1 and 2) fixed to the machine frame by means of fixing supports (3 and 4), the assemblies (1 and 2) being provided with milling assemblies (101 and 102) that are displaced to perform the rounding and trimming of ABS/PVC edges through linear-movement assemblies (103 and 104), which are capable of performing the operation of trimming and rounding panels simultaneously, by the combined movement of both groups so as to be capable of trimming and rounding the 4 faces or the panel (21) coated with edge of ABS/PVC or the like in a single pass simultaneously with the panel (21) in continuous motion.

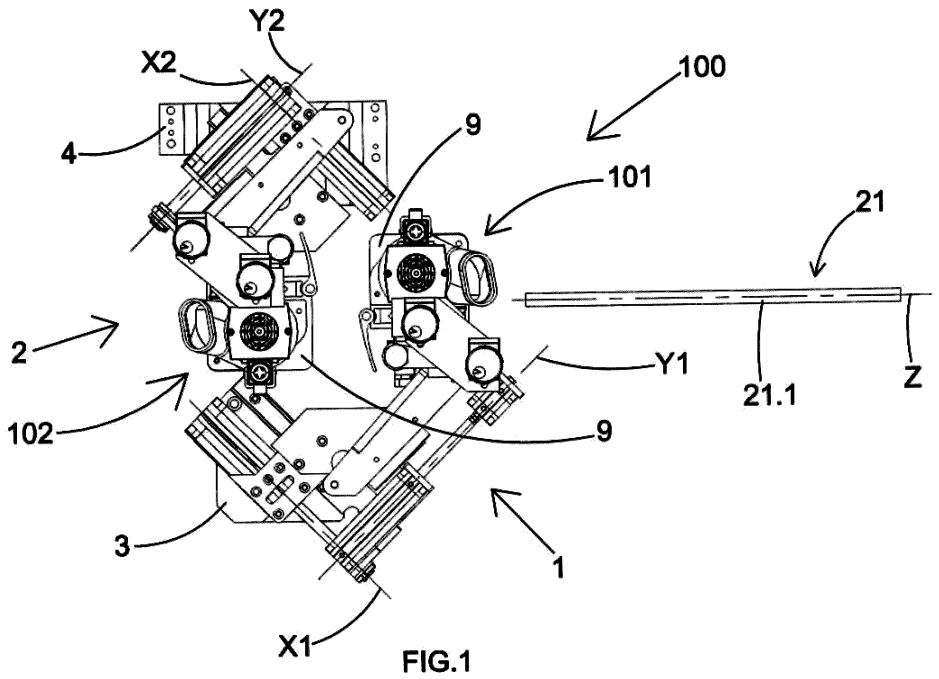

FIG.1

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Description

[0001] The present invention relates to a rounding and trimming group, particularly used in the branch of furniture manufacture, which enables one to carry out operations of trimming and rounding ABS/PVC edges that are attached to panels. The present group has linear and simultaneous movements, the objective of which is to obtain a group with less assembling complexity and that is more compact, since the existing groups are complex and require larger space for carrying out the operations.

[0002] At present, MDF (medium density fiber) is known for its possibility of replacing native or reforested wood, by various forms of application, as a function of its homogeneity, versatility, ease of machining the work-piece, resistant to attack by microorganisms, among others. In spite of this, in the first phase of the production process it is only possible to apply painting or texture to the plane part of the panels, due to the varied dimensions related to the use, such as doors, drawers, etc., the edge part or side part remaining exposed, which leaves much to be desired as far as esthetics is concerned. So, a subsequent finish is necessary, after cutting the plates into customized sized.

[0003] In the production of furniture on a large scale, in order for apparent parts of panels formed from materials such as MDF, wood laminates, among other things, the panels are usually completed on their side finish by application of a border, through gluing, usually of ABS/PVC, which is subsequently machined, finished by rounding the ends.

[0004] The edges strips made of ABS/PVC are used for improving the finish and protecting the panels against risks while handling them. The edge strips have different types of texture, brightness, color and adhere solidly to the base.

[0005] Present-day machines for finishing pieces of furniture are assemblies of independent processing evolutions, which were being integrated to each other in order to form more productive single assemblies. Usually, the panel processing begins by trimming the dimension of the edges, with a view to make the dimension quite uniform in the beginning of the processing.

[0006] After this, the edge is introduced and guided through a main roller and leading rollers, which come close to the panel side. Other equipment prepares the surface, applying warmed glue and then another device pressing the edge against the panel through rollers, thus fixing the edge do the panel.

[0007] Then, an initial cut is made to release the panel that is in continuous movement from the edge.

[0008] After gluing the edge strip to the panel, excess-cutting process known as "destopo" is performed to cut the lateral excesses on the edge strip off the panel, and subsequently the trimming (precise cutting of the edge width) is performed on the panels. One may further round these edges if necessary, thus imparting the desired final finish to the work-piece, without forming barbs.

[0009] In prior-art cases this rounding process is made usually after the panel has been completed by gluing edges on separated machines, wherein an adequately profiled tool is moved around the panel, following its contour, while the panel remains motionless, in some types of prior-art machines.

[0010] This system is widely performed, but it has the disadvantage of requiring an additional process step and separate sets of equipment.

[0011] European patent EP0395996 describes a rounding assembly applied to a machine designed for trimming operations, comprising a rounding-processing assembly mounted on a support that turns around an axis inside the panel profile and corresponds to the symmetry axis of the panel itself, parallel to the tool. The tool is brought into contact with the panel, where it turns on the support around the panel-symmetry axis, so as to make the opposite end rounded.

[0012] This rounding assembly has the drawback that its rotation axis should coincide with the panel-symmetry axis and the machine should be adjusted whenever a panel with a different thickness is processed, besides only performing this operation in a static manner.

[0013] In patent EP0911100A2, some of these drawbacks were eliminated, the trimming process being performed while the panel advances continuously, using an in-line rounding assembly and a device capable of automatically adapting itself to panels of various thicknesses, in order to solve the problems mentioned above, without having to interrupt the work to calibrate and adjust the machine. This mentioned problem has been solved by the present invention, which provides a rounding unit for processing panel edges that include a movable support advancing along the panel, a tool mounted on the support and capable of moving along a pair of axis perpendicularly to the direction of advance of the panel, and means capable of moving said support forward together with the panel, while turning it simultaneously around one of the axis perpendicular to the direction of forward motion of the panel and parallel to the tool axis.

[0014] However, this equipment has the drawback of occupying much room, since the operation should take place with the panel in motion, which is difficult with this type of device, because its conception requires the presence of a rotary support and, if one desires to achieve the rounding of the panel in a single pass, there is a need to duplicate the length of the rounding device.

[0015] In patent EP001719594, it is presented an evolution of patent EP0911100A2, wherein one sought solutions for controlling motorization and use of inserters, in order to control milling in regions of difficult access.

[0016] More recently, solutions have been incorporated as, for instance, in patent EP1964654, which, in its main claim, deals with a system with a lateral actuation to guarantee alignment of the milling tool, while the panel moves.

[0017] In all of these patents it is observed the constructive evolution, but without solving this issue related

to the size of the equipment intended for this edge rounding operation.

[0018] In order to eliminate the drawbacks of the prior art, one has developed a trimming and rounding assembly that enables one to perform the finish of the quadrants of ABS/PVC-panel edges simultaneously. Advantageously, this assembly also enables one to trim, that is, to cut off the excess on the edge at the upper and lower portions.

[0019] The present rounding and trimming group for panel edges, as compared with the prior art, enables this step to be performed virtually in a simultaneous manner, using for this purpose a combination of actuators of pneumatic type, "V"-arranged , forming between them relationships of approximately 90 degrees and approximately 45 degrees with respect to the longitudinal pass of the panels to be rounded, so as to coordinate the joint actuation of two milling devices.

[0020] Another advantage refers to the space and arrangement of assembly thereof, since the group is compact, requiring little room for installation, thus enabling one to reduce the final machine size.

[0021] Another advantage of this assembly relates to the simplicity of mounting it on the machine, as well as adjusting and actuating the movement assemblies of the cutting tools that perform the panel finish.

[0022] A further advantage relates to its manufacture cost, because it has a smaller number of components to perform the trimming and rounding operations.

Brief description of the invention

[0023] Said rounding and trimming groups for panel edges enables one to perform the finish on the 4 panel faces, that is to say, the front face edges with respect to its displacement will be rounded and trimmed at the same time, and said longitudinal edges with respect to the panel displacement will be rounded. If desired, the present group enables one to perform only the trimming steps on the front edge, that is, when the ABS/PVC edge is glued and one needs to remove the excess that has remained exposed on the upper front part and lower front part of the panel with respect to its length in a correct manner, with a view to remove excesses of the initial cutting.

[0024] Thus, it is possible to notice that the present invention enables new operations, either for rounding and/or trimming ABS/PVC edges, according to the format copied, that is, by only performing the trimming without great preparation and adjustments, coupling all of this to the simplicity of construction and distribution of the actuators, so that they will remain somewhat intertwined with each other, unlike others of the prior art that take up a much larger space and more complex components to carry out the same work.

[0025] Schematic figures of a particular embodiment of the invention are presented hereinafter, the dimensions and proportions of which are not necessarily real, since the figures are intended only for presenting didactically its various features, the protection comprehension of which is determined only by the scope of the accompanying claims.

Brief description of the drawings

[0026]

Figure 1 presents a front view of the edge rounding and/trimming group, showing an initial operation position;

Figure 2 shows a cross-sectional view of a panel with edges to trim (21), an electric motor (22), a horizontal (9) and vertical (10) copying element and a milling tool (24);

Figure 3 presents a front view of the edge rounding and/or trimming group, showing an operation position, wherein the actuator (12) of pneumatic type is active and the actuators (11, 13 and 14) of pneumatic type are retracted;

Figure 4 presents a front view of the edge rounding and/or trimming group, showing an operation position, wherein the actuators (12, and 14) are active and the actuators (11 and 13) are retracted;

Figure 5 presents a front view of the edge rounding and/trimming group, showing an operation position, wherein the actuator (14) is active and the actuators (11, 12 and 13) are retracted;

Figure 6 presents a front view of the edge rounding and/trimming groups, showing an operation position, wherein the actuators (13 and 14) are active and the actuators (11 and 12) are retracted;

Figure 7 presents a perspective back view of the edge rounding and/or trimming group (100), performing only the operation of trimming ABS/PVC edges.

Detailed description of the invention

[0027] As shown in the attached figures, the rounding and trimming group (100) for panel edges is formed by two rounding and/or trimming assemblies (1 and 2) fixed to a machine frame (not shown) by means of fixing supports (3 and 4) provided with milling devices (101 and 102) that are displaced, so as to perform the rounding and trimming of ABS/PVC edges, by means of actuators (11, 12, 13 and 14) through linear guides (5, 6, 7, and 8), referring to axes (X1, Y1, X2 and Y2), respectively, capable of performing the operation of trimming and rounding panels simultaneously, on the 4 edge faces (21.1) of the panel (21) covered with edges of PVC or the like in a single pass simultaneously with the panel (21) in continuous motion.

[0028] Said milling devices (101 and 102), arranged on the assemblies (1 and 2), are provided with at least one horizontal copier (9) and one vertical copier (10), a milling tool (24), fine-adjustment clocks (15 and 16), chip outlet (17) and motor (22).

[0029] The displacement of the milling device (101) for rounding or trimming edges (21.1) of the panel (21) is carried out by means of at least two linear guides (5, 6) and actuators (11, 12) of pneumatic type, V-arranged under an angle of approximately 90 degrees or approximately 45 degrees with respect to the longitudinal passage of the panels to be rounded, the displacement of the milling device (102) being carried out by means of at least two linear guides (7 and 8) and actuators (13 and 14) of pneumatic type, also V-arranged at approximately 90 degrees with respect to each other or approximately 45 degrees with respect to the longitudinal passage of the panels to be rounded.

[0030] Figure 1 shows the starting position of the rounding and trimming group (100), composed of two assemblies (1 and 2) arranged in an inverted manner, positioned strategically with respect to each other, wherein the supporting of the assembly (1) on the machine structure is achieved by means of the lower support (3) and that of the assembly (2) by means of the upper support (4), each assembly performing 50% of the operation, that is, the group (1) performs the rounding and/or trimming of the lower corners of the panels and the group (2) handles the upper corners thereof simultaneously.

[0031] This operation is carried out virtually in a simultaneous manner. For this rounding and trimming operation, the milling devices (101 and 102) are moved with the aid of at least two actuators each. The return or advance movement of the milling device (101) is carried out through the actuator (12), which is oriented by the linear guide (6) referring to the axis (Y1) and the linear guide (5), oriented by the axis (X1), so as to form an angle of approximately 90 degrees with respect to each other, plus the return or advance movement of the actuator (11), the device being capable of making the necessary movements of the whole operation of rounding and/or trimming the panel edges, with respect to their shapes.

[0032] In order for the milling device (101) to have contact with the workpiece to be rounded and/or trimmed, it is further composed by a horizontal copier (9) and a vertical copier (10), so that a cutting tool repeats a pre-shape inserted into the equipment, where the horizontal copier (9) and the vertical copier (10) goes around this pre-shape, imparting an identical shape to the workpiece being milled.

[0033] Such milling tools (101 and 102) perform the operation on each rounding and/or trimming group with the aid of a motor 922) and fine-adjustment clocks (15 and 16), to guarantee total control capability throughout the production process.

[0034] One can also observe actuators (13 and 14), attached to the support (4) for fixation to the equipment (not shown), connected to linear guides (7 and 8) and orientation axes (X2 and Y2), in a manner inversely identical to the assembly (1), but with a slightly offset positioning with respect to the advance of the panels to be processed.

[0035] The assembly (1) is composed by a support (3) attached to the machine (not shown), an actuator (11) that moves on the axis (X1), supported by the linear guide (5), supported by the linear guide (6). These components enable the motor (22), the horizontal copier (9) and the vertical copier (10), chip outlet (17) and milling tool (24) to make the necessary movement for adequately performing simultaneous rounding and/or trimming of edges (21.1) of ABS/PVC or the like, aided by the actuators.

[0036] In a similar way, the assembly (2) is composed by a support (4) attached to the machine (not shown), a cylinder (13) that moves on the axis (X2), supported by the linear guide (7), a second actuator (14) that moves along the axis (Y2), supported by the linear guide (8). These components enable the motor (22), the horizontal copier (9) and the vertical copier (10), chip outlet (17) and milling tool (24), to make the necessary movement for adequately performing simultaneous rounding and/or trimming of edges (21.1) of ABS/PVC or the like, aided by the actuators.

[0037] One observes in Figure 2 a cross-sectional view of the assembly (1), showing, in detail, the horizontal copier (9) and the vertical copier (10), the assembly (1) in contact with the panel (21), rounding the edge (21.1), and then profiling the panel (21).

[0038] In Figure 3 one can see the approach of the milling device (101) to the milling device (102) by means of the linear guide (6), where the panel (21) too advances on a guide (not shown) arranged on the machine (not shown), referring to the axis (Z), which is detected by the copiers (9) and (10). From this moment on, the milling tool (24) begins the process of rounding the lower face of the front edge, where the retreated actuator (12), guided by the axis (Y1), brings the milling tool (24) to the lower part of the panel (21). From this movement, it remains stable, while the panel (21) continues its continuous motion guided by the axis (Z), trimming the lower side part of the panel (21).

[0039] As shown in Figure 4, the milling device (102) is displaced through the linear guide (8) by means of the advance of the actuator (13), guided by the axis (X2), thus beginning its contact with the panel (21), referring to the axis (Z), first rounding the upper face of the panel (21), until the milling device (102) also begins to trim the upper side part of the panel (21) in a continuous motion.

[0040] On the other hand, in Figure 5 one observes the milling device (101) making a rising movement through the linear guide (5) with respect to the panel (21), caused by the return movement of the actuator (11) guided by the axis (X1), thus rounding the lower part of the panel (21) on the back face.

[0041] Finishing the rounding and/or trimming operations, Figure 6 shows the advance of the actuator (14) displacing the milling device (102) through the linear guide (7), guided by the axis (Y2), with respect to the panel (21), thus performing the operation of the upper rounding of the back face of the panel (21). In this way, steps of rounding and trimming the panels (21) are completed and the assemblies (1 and 2) return to their initial

rest position, as shown in Figure 1, awaiting the next panel to be processed.

[0042] The present rounding and trimming group (100) enables one to carry out the operation of trimming ABS/PVC edges (21.1) and, as shown in Figure 7, each assembly (1 and 2) is equipped with auxiliary actuators (11b and 14b), which upon actuation displace only the milling devices (101 and 102), thus trimming the face of the ABS/PVC panels, that is, when the edge (21.1) is glued and one has to remove the excess that has remained exposed on the upper and lower part of the panels.

[0043] The sequence of driving the actuators so as to enable only the trimming is as follows: the actuator (11) continues active, but the actuator (12) is retracted and brings along the milling device (101) downward. At this moment, the actuator (11b) is activated, moving the milling device (101) sufficiently for trimming the lower part of the panel (21). In order to perform the upper trimming of the panel, the actuator (14) remains retracted and the actuator 913) is activated, bringing along the milling device (102) upward. At this moment, the actuator (14b) is activated, moving the milling device (102) sufficiently for upper trimming of the panel (21), that is to say, in practice the movement of passing the panels plus the movement of the actuators generate a movement between the at approximately 90 degrees, enabling the desired trimming.

[0044] A person skilled in the art will promptly infer, from the description and the drawings presented, various ways of carrying out the invention, without departing from the scope of the accompanying claims.

Claims

1. A rounding and trimming group for panel edges, **characterized by** comprising two rounding and/trimming assemblies, a lower one (1) and an upper one (2), arranged in an inverted manner and associated to milling devices (101 and 102), displaced by means of actuators (11, 12, 13 and 14) through linear guides (5, 6, 7 and 8), referring to the axes (X1, Y1, X2 and Y2), respectively, arranged in V so as to perform the operations of rounding and trimming the 4 faces of the panel (21) coated with edges of ABS/PVC or the like in a single pass simultaneously with the panel (21) in continuous motion.

2. The rounding and trimming group for panel edges, according to claim 1, **characterized in that** the rounding and/or performing assemblies (1 and 2) are fixed to the machine frame (not shown) by means of fixing supports (3 and 4).

3. The rounding and trimming group for panel edges, according to claim 1, **characterized in that** the milling devices (101 and 102) comprise at least one horizontal copier (9) and one vertical copier (10); cutting tool (24); motor (22) for moving the cutting tool (24); and fine-adjustment clocks (15) and (16).

4. The rounding and trimming group for panel edges, according to claims 1 and 4, **characterized in that** the milling devices (101) and (102) have a chip outlet (17).

5. The rounding and trimming group for panel edges, according to claim 1, **characterized in that** the assemblies (1 and 2) comprise auxiliary actuators (11b and 14b), to displace the milling devices (101 and 102) so as to perform the operation of trimming edges of ABS/PVC or the like.

6. The rounding and trimming group for panel edges, according to claim 1, **characterized in that** the actuators (11, 12, 13, 14, 11b and 14b) are of pneumatic type.

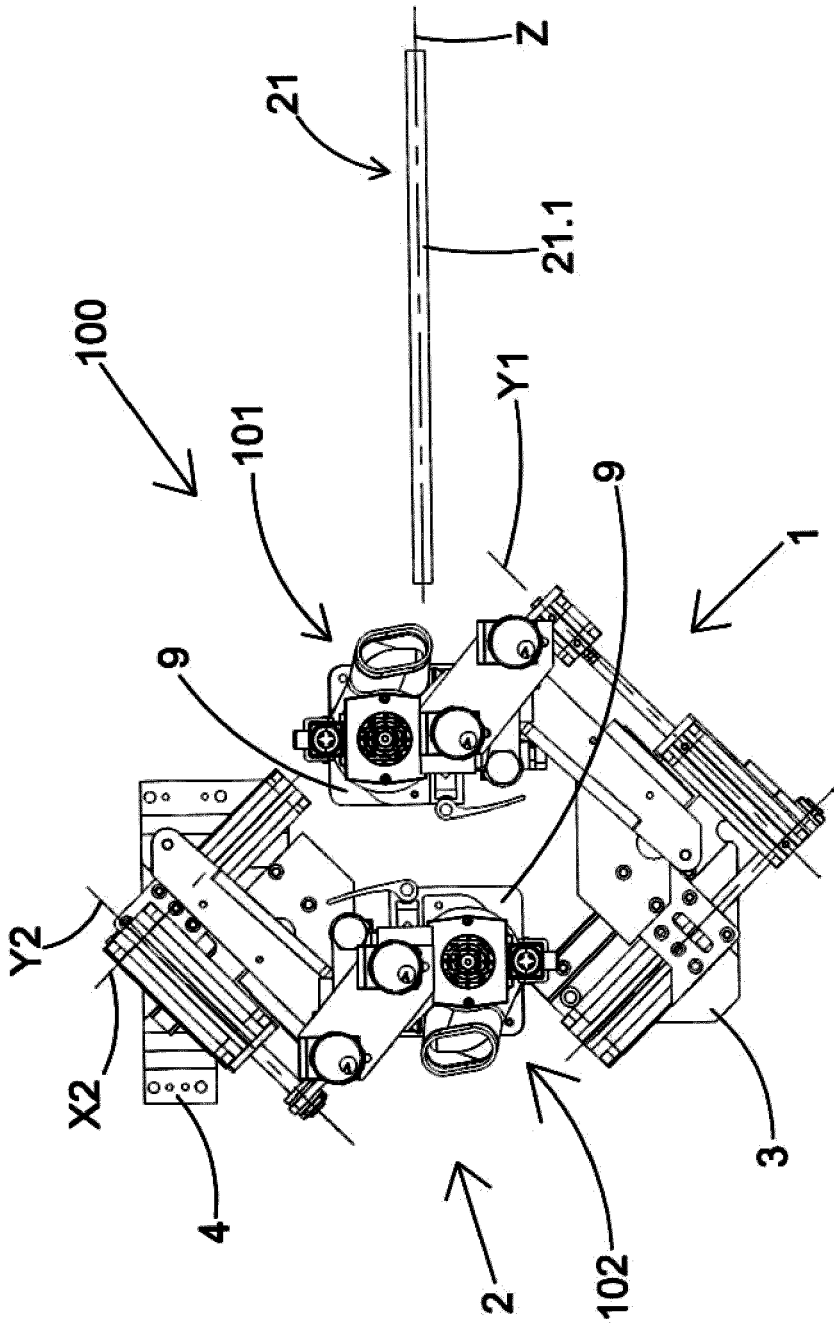


FIG.1

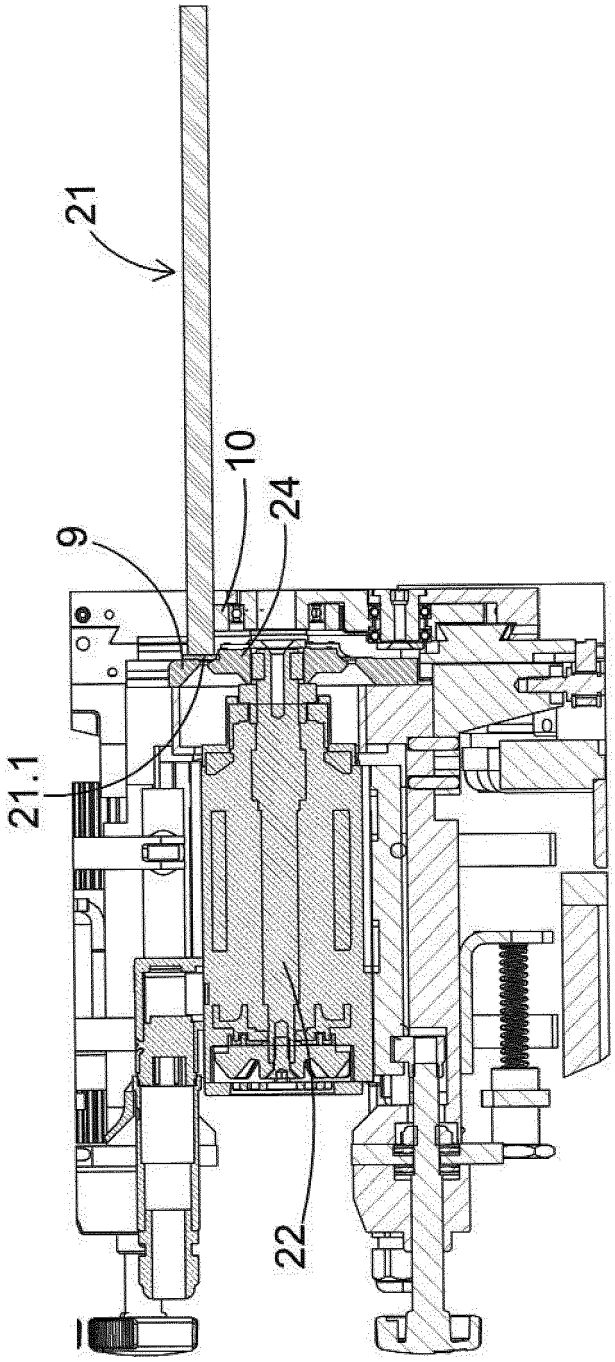
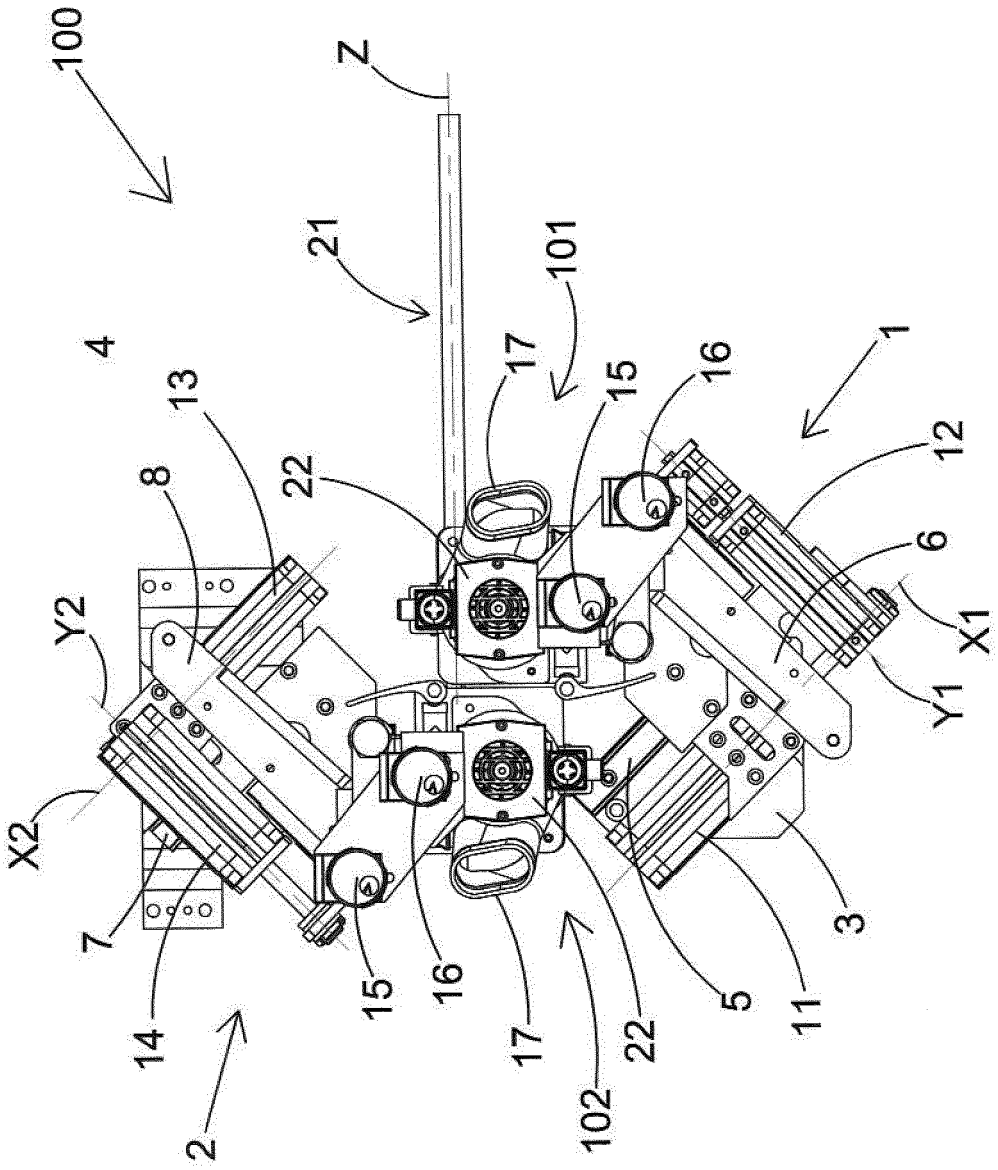


FIG.2


100
Z
21
101
4
13
17
15
16
1
8
22
12
6
Y2
X1
Y1
X2
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15
16
17
22
5
11
2
102

FIG.3

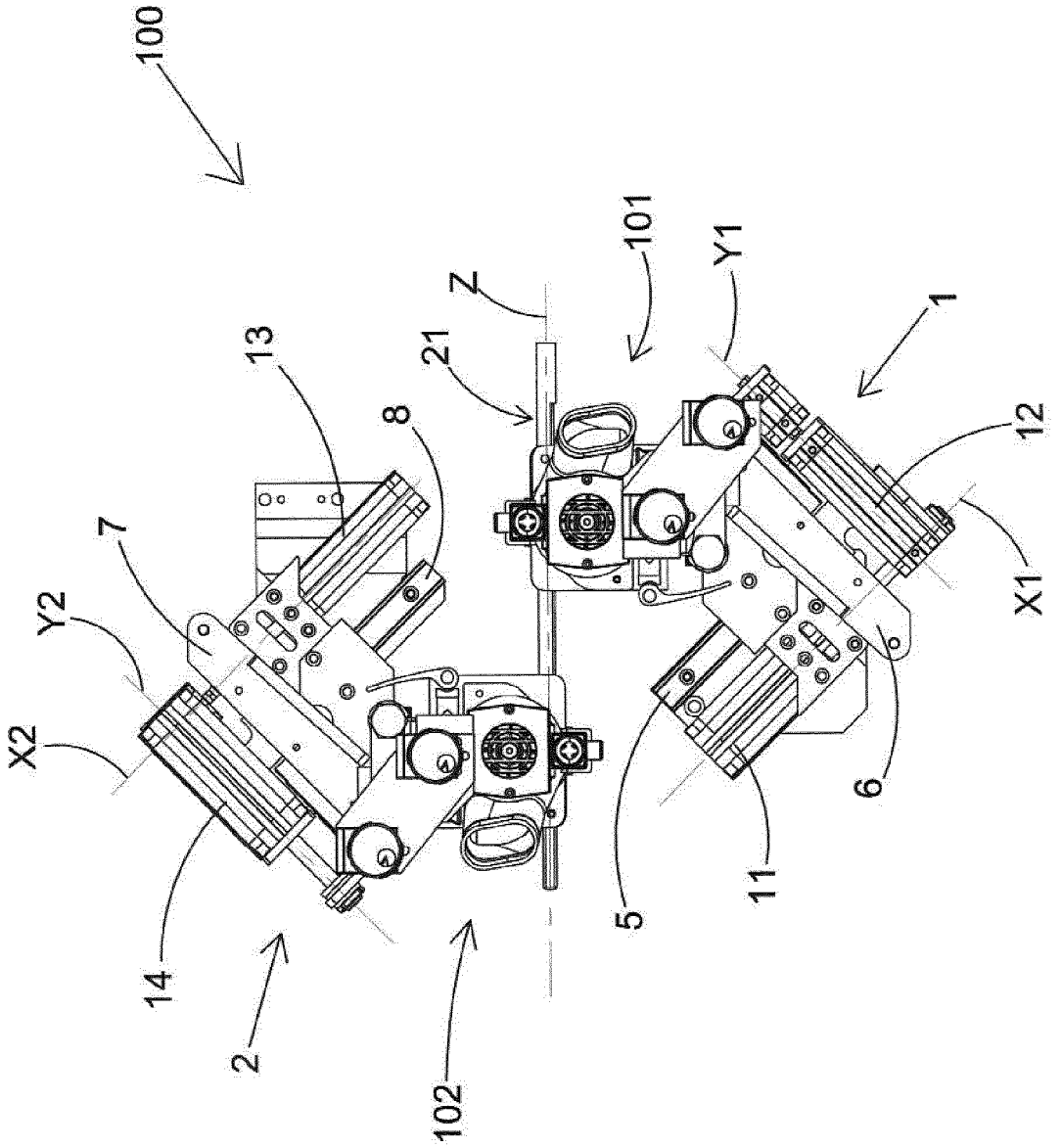

FIG.4

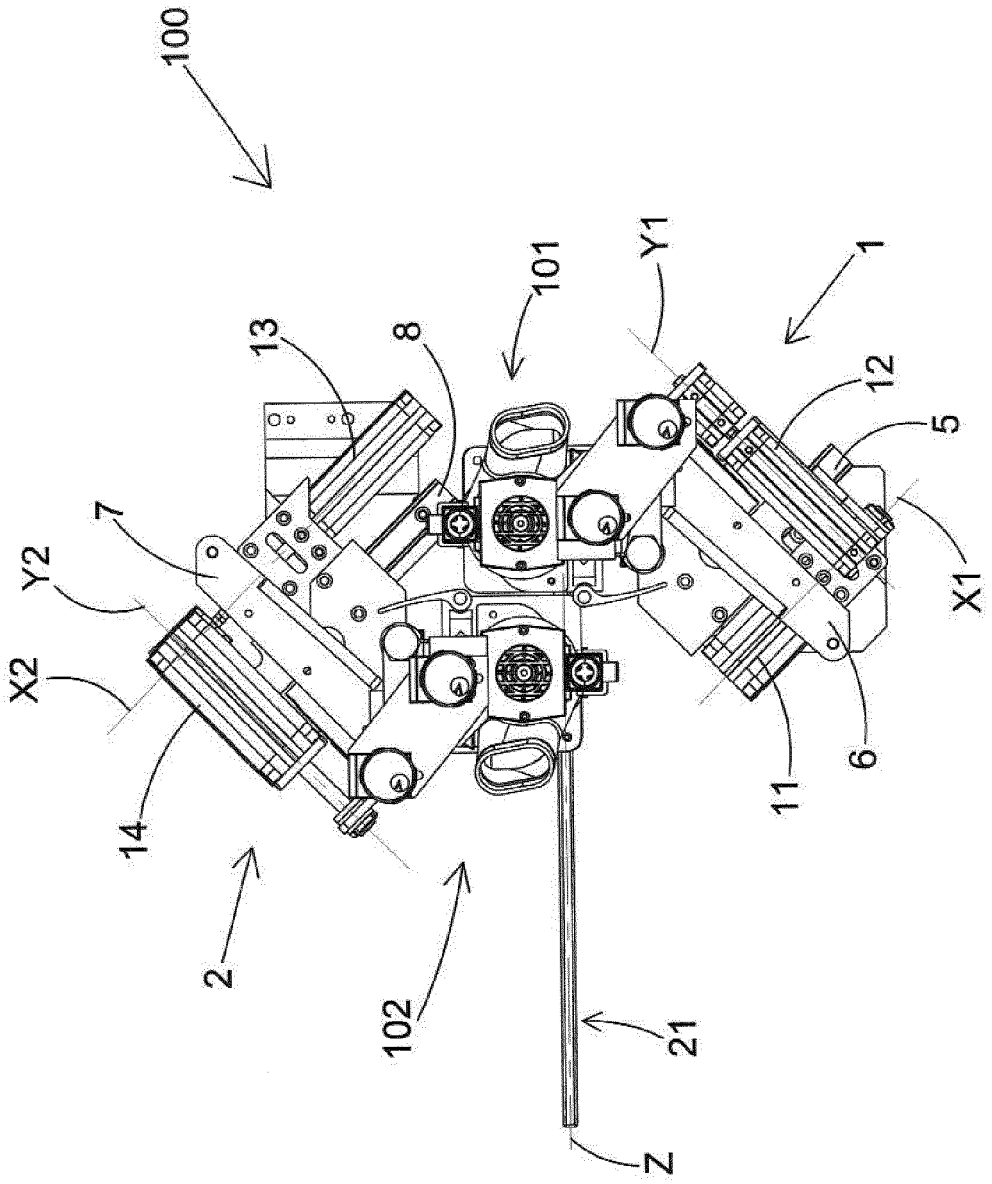

FIG.5

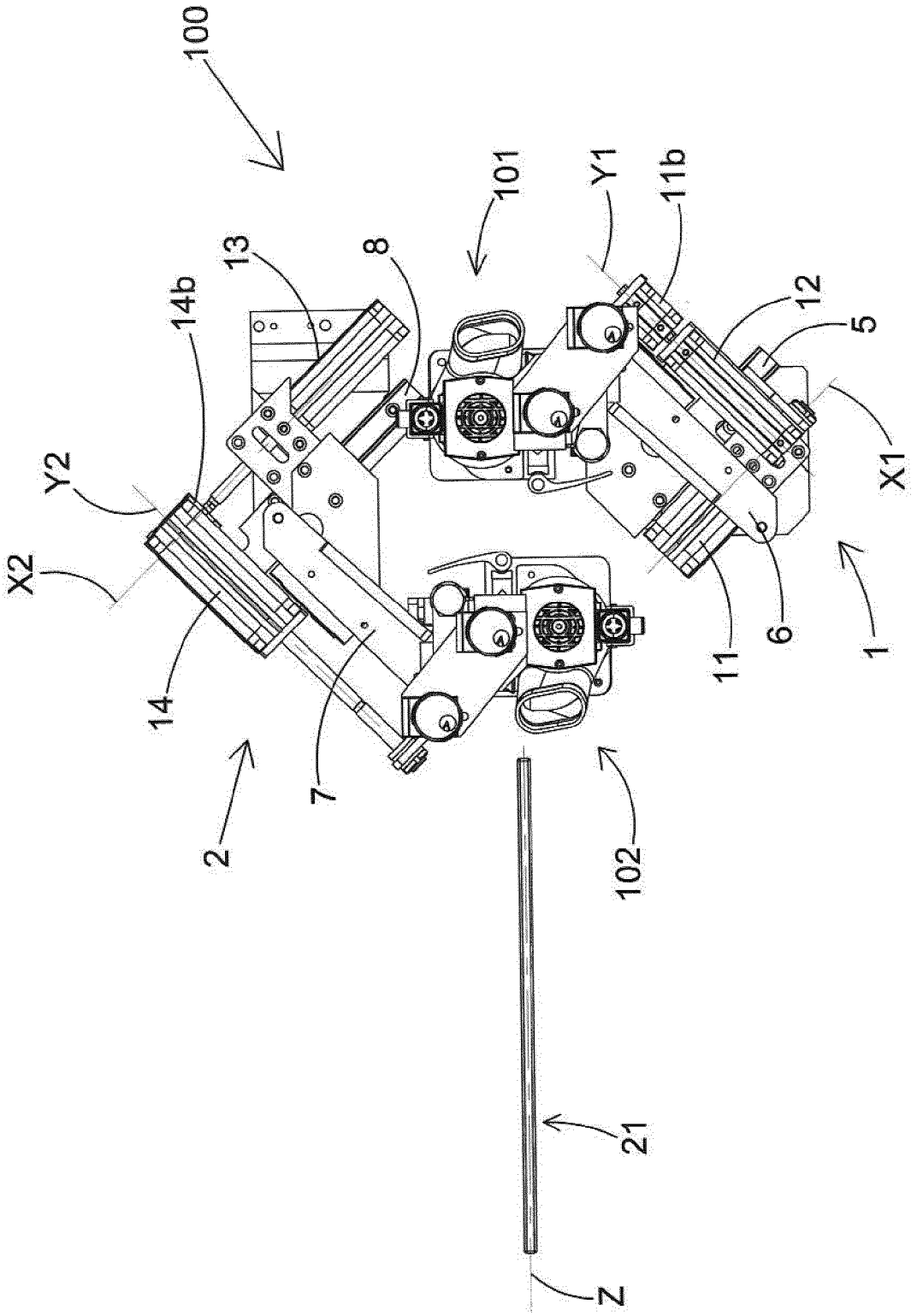

FIG.6

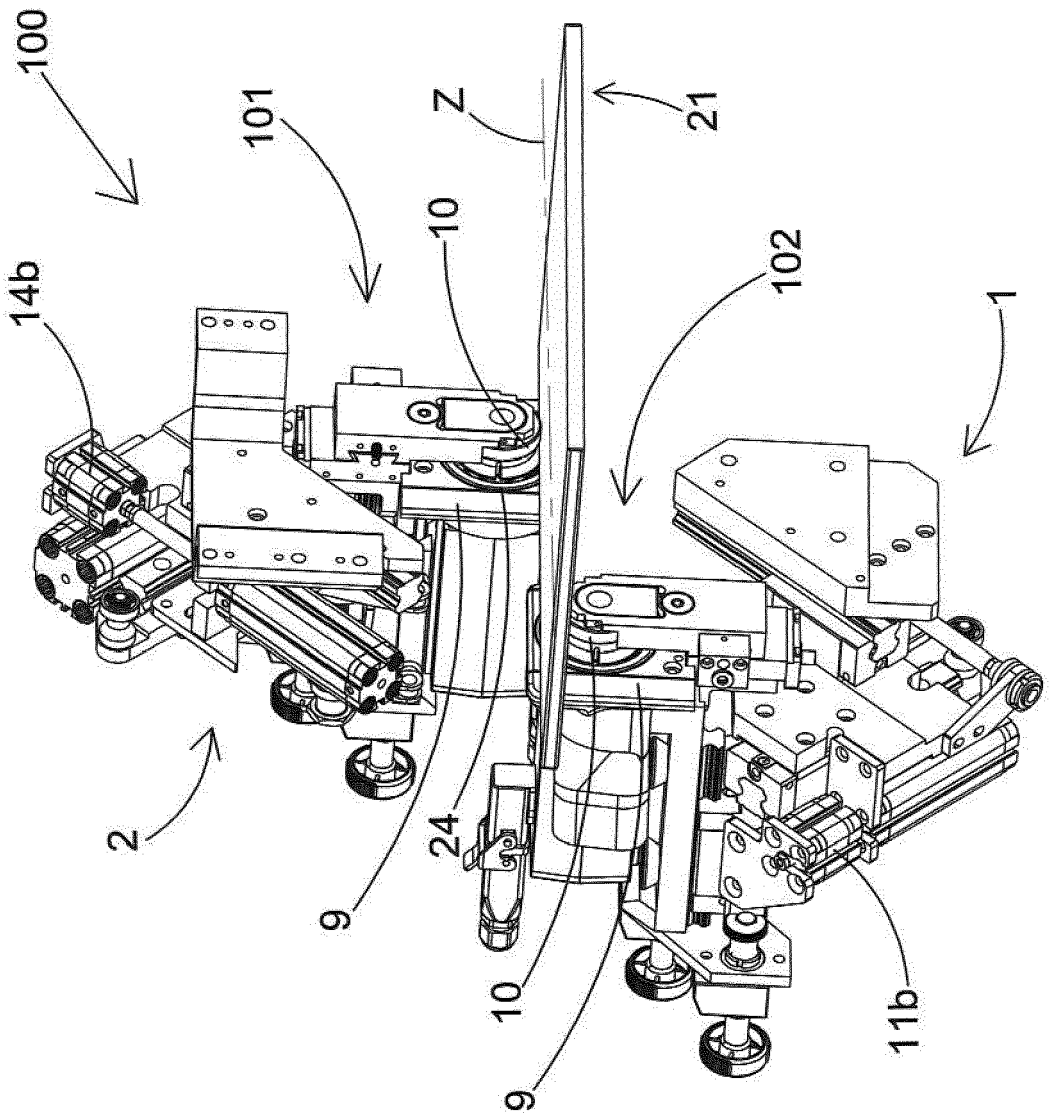

FIG.7

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EUROPEAN SEARCH REPORT

Application Number
EP 13 42 5100

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	EP 0 997 245 A2 (SCM GROUP SPA [IT]) 3 May 2000 (2000-05-03) * abstract * * paragraph [0020] * * paragraph [0022] * * paragraph [0024] - paragraph [0025] * * paragraph [0025] * * paragraph [0032] * * paragraph [0036] - paragraph [0037] * * claim 1 * * figures *	1-6	INV. B27D5/00
A	FR 2 157 888 A1 (ZOIA MICHELE ZOIA MICHELE [IT]) 8 June 1973 (1973-06-08) * figure 2 *	3	

TECHNICAL FIELDS SEARCHED (IPC)

B27D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 November 2013	Hamel, Pascal

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1

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12-11-2013

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