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(54) **Edge bander for panels with an apparatus for machining edges**

(57) An edge bander (1) for panels (4) comprises at least one tool (2) designed to perform stock removal on an edge (3) of the panel (4) with a cutting motion that is in the opposite direction to a relative feed motion of the panel (4) relative to the tool (2). There is one tool (2) and it is designed to machine the edge (3) between a first end (7), marking the start of stock removal machining, and a second end (8), marking the end of said machining, the

ends (7, 8) delimiting the entire length of the edge (3). The edge bander (1) comprises a block (16) made of suitable material, designed to be positioned in contact with the panel (4), as a continuation of the edge (3) being machined and at the second end (8); and positioning means (23) for positioning the block (16) removably relative to the panel (4) and in such a way that it is suitably synchronised with the relative instantaneous position of the tool (2) relative to the edge (3).

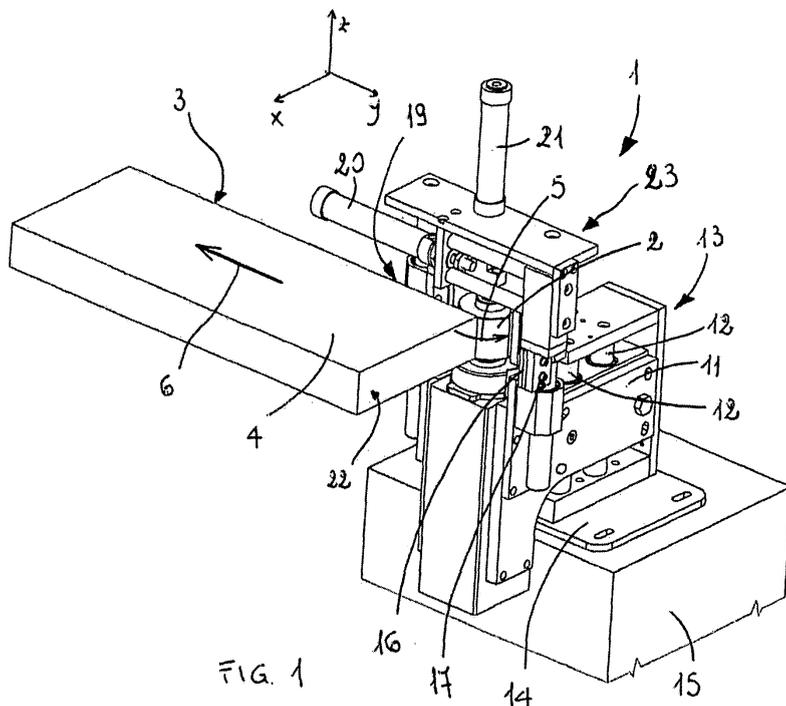


FIG. 1

Description

[0001] The present invention relates to an edge bander for panels, in particular panels for furniture and/or for furnishings.

[0002] As is known, a generic panel for a piece of furniture consists of a sheet of material, wooden or chip-board, which is delimited by an overall border surface having the shape of a parallelepiped. Said surface consists in particular of two large, parallel base surfaces, and of an intermediate lateral surface which is transversal to them, which borders the panel at its thickness.

[0003] The term edge banding is used in the relevant sector to indicate the application to the lateral surface of panels, using hot-melt glue, and at the sides forming their border, of coverings made of suitable materials, (PVC, wooden materials, ABS or various types of laminates) designed to make the panel ready to be an integral part of the piece of furniture or furnishings in general for which the panel is intended.

[0004] Panels are edge banded using automatic machines called edge banders. Before applying the covering material, the machines prepare the edges of the panel to eliminate any defects caused by previous machining operations and to make the panel suitable for receiving the covering material. Said defects may have various causes. For example, linearity errors caused by panel cutting with manual or automatic saws. Or they may consist of more or less superficial splintering caused by panel cutting when some surfaces, for example the base surfaces, have already been covered with the covering material, laminate, wooden or more simply covered with one or more layers of paint.

[0005] To perform such machining operations, prior art edge banders are equipped with correcting units which suitably prepare the panel edges before application of the layers of edge covering material.

[0006] However, since the four edges which border a generic panel are prepared in sequence, it may be the case that - when preparing the edge relative to a generic side and close to the ends of said side - the tools of the correcting apparatus may interfere with an adjacent edge of the panel which has already been covered, with the risk that the latter may be splintered and damaged, thus compromising its level of quality.

[0007] A prior art device for avoiding such disadvantages consists of machining the surfaces of the edges to be prepared with tools which perform "opposing" stock removal, which means that stock removal takes place in a condition such that the motion of the tool and the relative feed motion of the panel relative to the tool, are in opposite directions to each other.

[0008] On a type of edge bander designed to implement this idea the correcting apparatuses are equipped with two separate machining units, each equipped with its own rotary tool.

[0009] The machining of the entire length of a panel edge is carried out partly by one tool and partly by the

other.

[0010] In practice, a first tool starts from one end of the side to be machined and carries out the machining by rotating in the opposite direction to the direction of panel feed relative to the tool. Operating in that way, the first tool machines one stretch of a generic side, the length of the stretch being less than the total length of said side.

[0011] When it reaches the end of its part of the total length, the tool is moved away from the edge and placed in the non-operating position.

[0012] At this point the second tool begins operating. Rotating in the opposite direction to the direction of rotation of the previous tool, it makes contact with the edge and completes the final stretch of the side being machined.

[0013] Since the direction of panel feed remains unchanged and since the second tool rotates in the opposite direction to the previous tool, when the side being machined is completed and in the condition in which the tool exits the side being machined and goes to interfere with the adjacent side of the panel, the opposition condition is again implemented, which for the adjacent side that has already been edge banded is decisive to prevent any damage to the covering.

[0014] The entry, exit and pressing movements against the edge by the apparatus tools are performed by pneumatic pistons acting one on the first tool and the other on the second tool, suitably pressing them against the side of the panel being machined.

[0015] The pressing action, which during machining presses the tool against the edge, has a relatively high intensity. Therefore, to prevent the panel from moving from the predetermined machining position, edge banders made in that way are equipped with systems for panel clamping and translation as they are fed along during machining, consisting of conveyor chains which have a rather rigid and heavy structure.

[0016] Finally, in order to provide suitable machining quality, the prior art described above needs a mechanical structure that is quite complex and expensive and which therefore disadvantageously is only suitable for large machines, designed for high production volumes. Only in those conditions is the purchase and use of such machines economically advantageous.

[0017] The present invention therefore has for a primary aim to overcome the above-mentioned disadvantages by providing an edge bander which, whilst providing machining quality comparable with that of higher level machines, has a simpler and therefore less expensive structure.

[0018] The invention has for a second aim to provide an edge bander which does not require tools to be moved away from and towards the edge being machined.

[0019] The invention also has for an aim to provide an edge bander which requires means for clamping and feeding panels being machined, said means having a structure that is simpler and less powerful and rigid.

[0020] The invention has for another aim to provide an

edge bander which can be used economically even in small production units and/or even for relatively low production volumes.

[0021] Accordingly, the present invention achieves said aims with an edge bander whose technical features may be clearly inferred from claim 1 and any of the claims dependent on it.

[0022] The advantages of the invention are apparent in the description which follows, with reference to the accompanying drawings, which illustrate a preferred, non-limiting embodiment of a technical solution in accordance with the invention, in which:

- Figure 1 is a three-dimensional perspective assembly view of an edge bander for panels, schematically illustrated, with some parts cut away to better illustrate others;
- Figure 2 is a top plan view of the edge bander of Figure 1;
- Figure 3 is a front elevation view of the edge bander of the previous figures;
- Figure 4 is a side view of the edge bander in accordance with the invention;
- Figure 5 is a three-dimensional perspective assembly view of the entire edge bander to which the details of the previous figures refer.

[0023] With reference to the accompanying drawings, the numeral 1 denotes as a whole a machine tool which is an edge bander for panels 4.

[0024] In the example of the machine 1 described reference is made to wooden panels 4, for example made of chipboard, at least partly covered with a covering layer, of paint, or with an outer aesthetic facing film which, as such, must not be damaged by routing, correcting or sanding machining carried out on other parts of the panel 4 which are still in the semifinished state. It shall be understood that such a use of the invention is described merely by way of example, without in any way limiting the scope of the invention, since the edge bander 1 may also operate on other types of panels 4, and on panels 4 which are not susceptible to damage during machining.

[0025] The edge bander 1 basically comprises a single rotary tool 2, which rotates about a vertical axis of rotation 9 and is driven by a suitably controlled electro-spindle 10.

[0026] The tool 2 and the electro-spindle 10 are supported in a position with the axis of rotation 9 of the tool 2 fixed and invariable, by a slide 11 which can move vertically, with the orientation Z, on guides 12.

[0027] The slide 11 is supported by a tool holder structure 13 fixed with flange means 14 to an edge bander 1 base structure 15.

[0028] With conventional clamping and feed means, not illustrated in the accompanying drawings since they are not part of the subject matter of the invention, the panel 4 with one edge 3 in contact with the perimeter of the tool 2 is fed, parallel with an orientation Y, along a direction of feed indicated by the arrow 6, whilst the tool

2 is rotated in the direction indicated by the arrow 5 which in Figure 1 appears to be anti-clockwise.

[0029] In that way, so-called opposing machining of the edge 3 of the panel 4 is carried out.

5 **[0030]** On the edge bander 1 the single tool 2 with which it is equipped machines the entire length of each side of the edge 3. In other words, if Figure 2 is taken as a reference, the entire length of the edge 3 of the panel 4 relative to the side appears to be contained between a first and a second end which are respectively labelled 7 and 8.

10 **[0031]** The first end 7 corresponds to the start of stock removal machining. In other words, it shall be considered as the point where the tool 2 initially makes contact with the edge 3 to be smoothed.

15 **[0032]** In contrast, the second end 8 shall be considered as the point where the tool 2 and the edge 3, kept in contact with each other up to that point, are separated from each other because machining of the edge 3 relative to the side delimited by the ends 7 and 8 is complete.

20 **[0033]** It should therefore be noticed that a single tool 2 machines the entire length of the edge 3, moving along the edge 3 always with the same orientation and in the same direction.

25 **[0034]** Figures 1, 3 and 4 show how the edge bander 1 is also equipped with a block 16 preferably made of composite, hard wooden material, removably supported by a support 17.

30 **[0035]** In turn the support 17 is mounted on two guide systems 18 and 19, at right angles to each other, which allow the block 16 to translate in a vertical plane ZY, longitudinally to the edge 3.

35 **[0036]** Connected to the guides 18 and 19 there are actuator means for driving the translation along the two orientations Y and Z. In particular, the actuator means comprise two pneumatic cylinders 20 and 21 positioned with the respective rods at right angles to each other.

40 **[0037]** The guides 18 and 19 and the cylinders 20 and 21 form positioning means 23 for positioning the block 16, removably relative to the panel 4, so that it is suitably synchronised with the relative instantaneous position of the tool 2 relative to the edge 3.

45 **[0038]** In practice, the block 16 moves in the plane ZY between two limit positions which are reached at predetermined positions of the tool 2 relative to the edge 3 during machining.

50 **[0039]** In a first, non-operating position, the block 16 is kept stationary and distanced from the edge 3, remaining in said condition for the entire time during which the tool 2 is machining correspondingly far from the exit end 8. The accompanying drawings show that said position can be obtained by extracting the rod 24 of the cylinder 21, said extraction causing the block 16 to be raised vertically on the tool holder structure 13, moving away from the panel 4, whilst, obviously, the relative position of the tool 2 and the edge 3 being machined has not changed. Therefore, in said first position, the block 16 does not interfere with the panel, which can be fed forward below

the block 16, freely in the direction indicated by the arrow 6.

[0040] In contrast, in the second, operating position the block 16 is moved into direct contact with a lateral edge 22 of the panel 4 trailing the panel 4 being fed forward. In this way, the block 16 is positioned as a continuation of the edge 3, which is virtually extended by the presence of the block 16, and it is positioned beyond the second end 8 where the tool 2 and the edge 3 will disengage because the edge 3 machining is complete.

[0041] While the block 16 remains in contact with the panel 4, between the fixed tool 2 and the block 16, which can translate thanks to retraction of the cylinder 20 rod 25, a movement of the tool 2 and the block 16 towards each other is produced, which may extend beyond the exit end 8, a condition in which the tool 2 performs stock removal on the block 16 which acts as a block of sacrificial material, that is to say a "spoil" block.

[0042] The contact offered by the block 16 therefore allows the entire length of the edge 3 to be machined without the risk of in any way damaging the lateral edge 22 of the panel 4 with which the block 16 is in contact. Therefore, even if the edge 22 is already covered, there is no splintering because the mechanical cause of interaction between the tool 2 and the edge 22 is transmitted to, and withstood by, the sacrificial block 16 instead of the edge 22 adjacent to the edge 3 being machined.

[0043] When edge 3 machining is complete, the block 16 returns to the first position and stands by for the next panel 4.

[0044] The edge bander 1 in accordance with the invention fulfils the aim of providing a machine construction solution which is particularly simple and economical which, put very briefly is achieved with the single tool 2 structure and fixed positioning of the tool 2.

[0045] Advantageously, fixed positioning of the tool 2 also allows the discharge onto the machine 1 base structure 15 of the components of the cutting stress directed in the panel 4 plane. This means that the machine 1 can be equipped with panel 4 clamping and feed means which are less rigid, less sturdy and ultimately less expensive.

[0046] Although the block 16 may potentially deteriorate with the passage of time, this is not a significant limitation, since the block 16, always operating in the same position and being made of very hard wooden material does not need substituting.

[0047] The invention described above is susceptible of industrial application and may be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all details of the invention may be substituted by technically equivalent elements.

Claims

1. An edge bander for panels of the type comprising at least one tool (2) designed to perform stock removal

on an edge (3) of the panel (4) with a cutting motion that is in the opposite direction to a relative feed motion of the panel (4) relative to the tool (2), the edge bander being **characterised in that** there is one tool (2) and it is designed to machine the edge (3) between a first end (7), marking the start of stock removal machining, and a second end (8), marking the end of said machining, the ends (7, 8) delimiting the entire length of the edge (3); the edge bander (1) comprising a block (16), made of suitable material and designed to be positioned in contact with the panel (4) as a continuation of the edge (3) being machined and at the second end (8); and positioning means (23) for positioning the block (16) removably relative to the panel (4) and in such a way that it is suitably synchronised with the relative instantaneous position of the tool (2) relative to the edge (3).

2. The edge bander according to claim 1, **characterised in that** the tool (2) is a rotary tool.

3. The edge bander according to claim 1 or 2, **characterised in that** the tool (2) is supported by a machine structure (15) with its axis of rotation (9) in a fixed position.

4. The edge bander according to claim 3, **characterised in that** the tool (2) is supported by a tool holder (13) structure (13) fixed to the base (15) of the edge bander (1).

5. The edge bander according to claim 1, **characterised in that** the block (16) can move subject to operation of the positioning means (23) in a plane (ZY) which is at a right angle to the plane in which the panel (4) lies and longitudinally to the edge (3).

6. The edge bander according to claim 5, **characterised in that** the block (16) is mounted on two orthogonal guides (18, 19), actuator means (20, 21) driving the block (16) on the guides (18, 19) so that it translates in the plane (ZY) between two limit position, a first of which is non-operating and distanced from the edge (3), the other position in contrast being operating and involving contact between the block (16) and the panel (4).

7. The edge bander according to claim 5, **characterised in that** the actuator means comprise pneumatic linear actuators (20, 21).

8. The edge bander according to any of the foregoing claims, **characterised in that** the block (16) is made of wooden material.

9. The edge bander according to any of the foregoing claims, **characterised in that** the block (16) is removably supported by a support (17) which is moved

by the positioning means (23).

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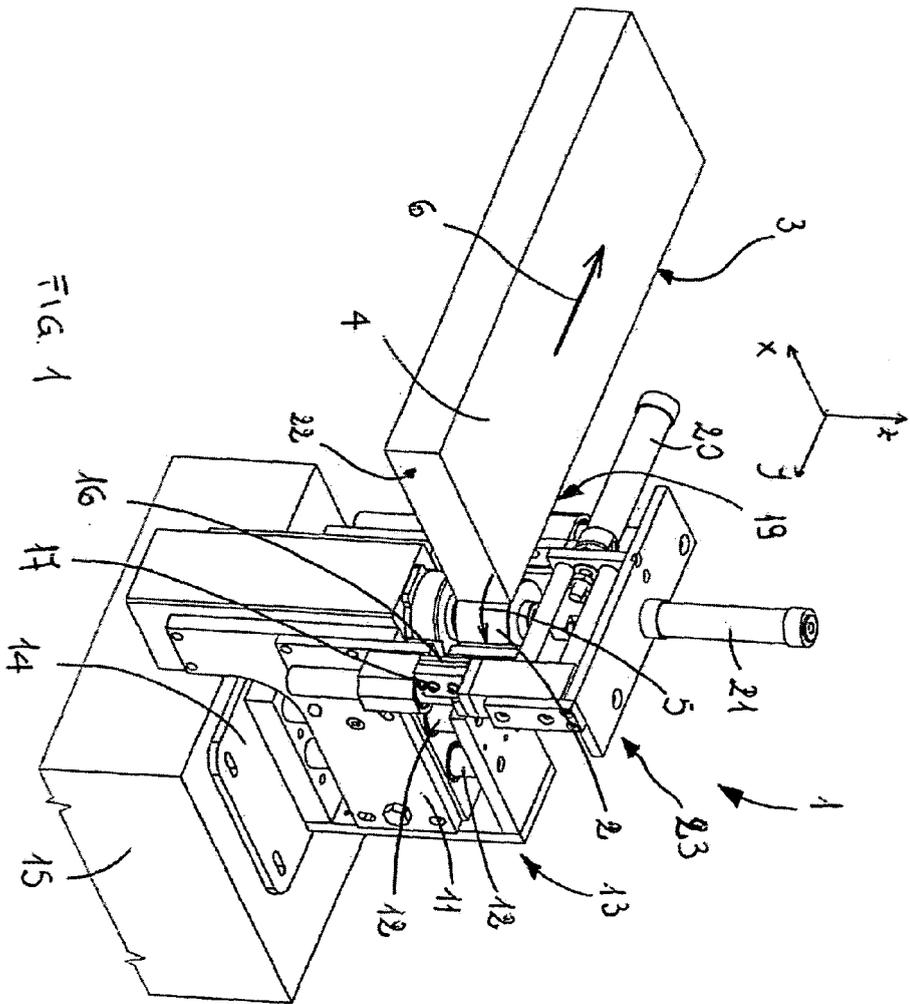
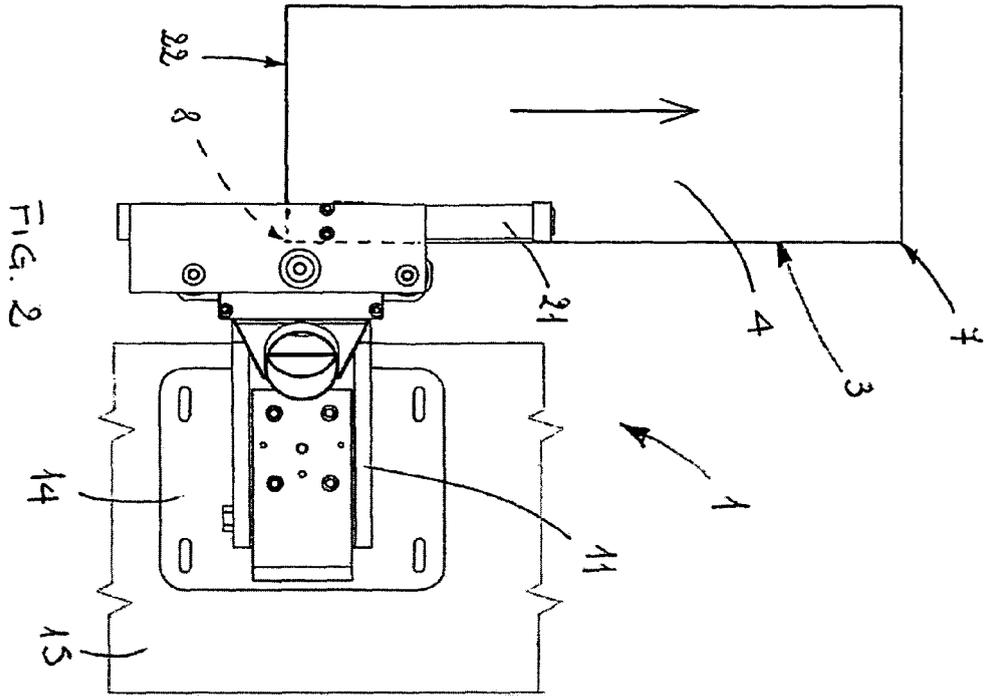
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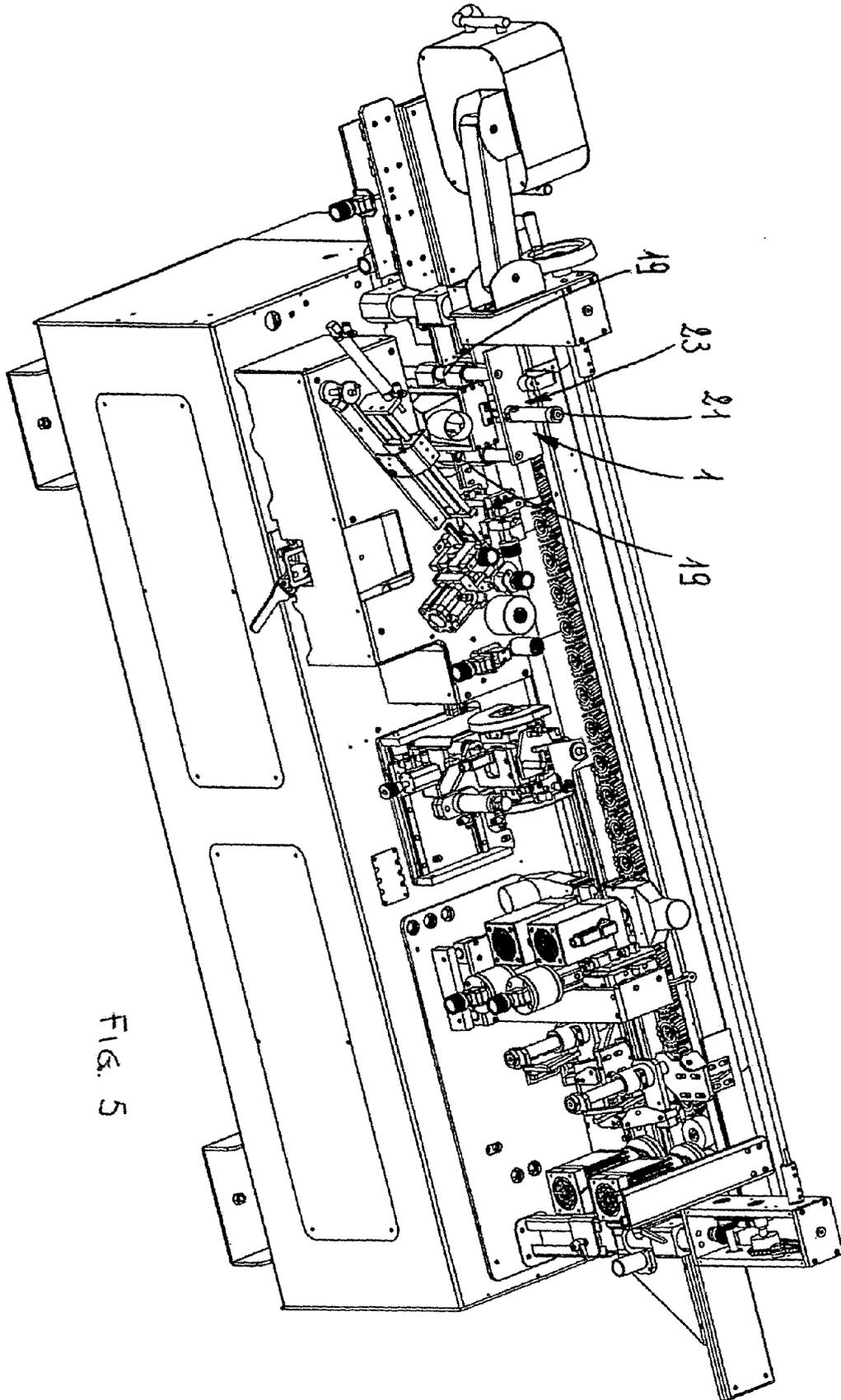


FIG. 5