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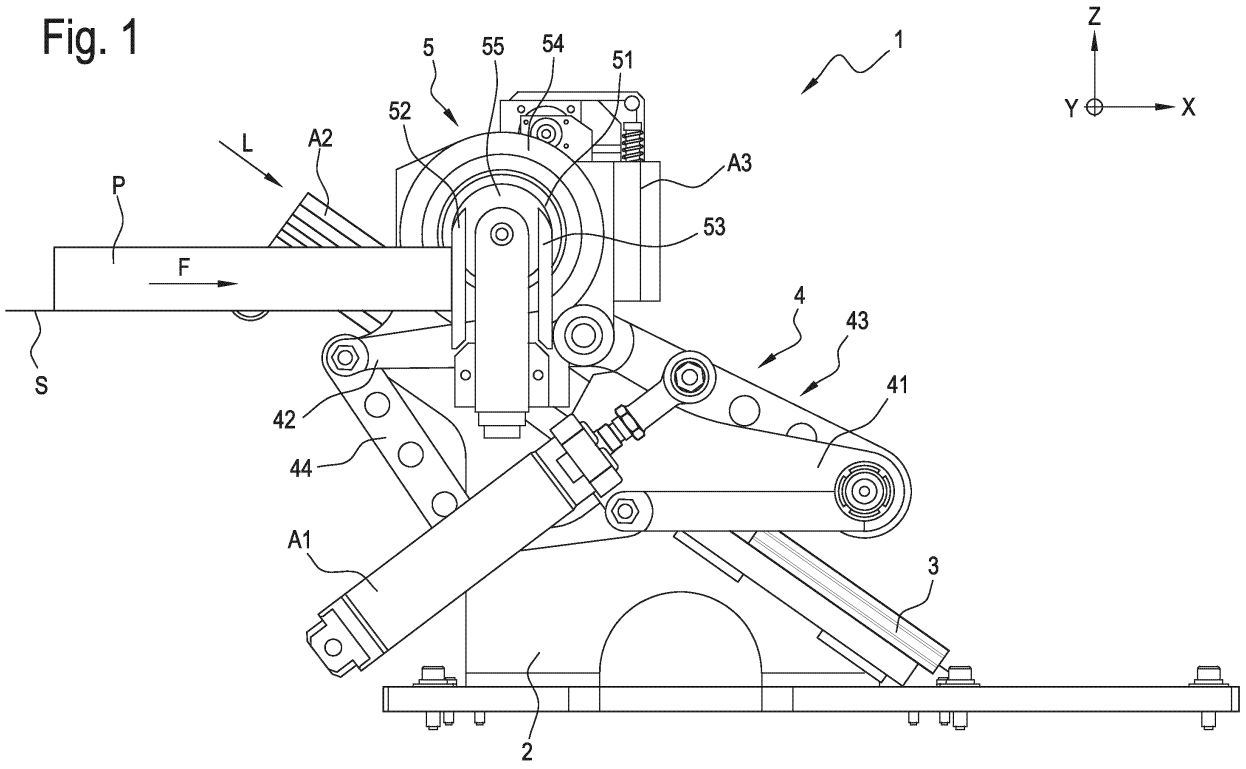
(54) **MACHINING UNIT**

(57) This invention relates to a machining unit for an edge banding machine comprising a supporting table for supporting a panel and a movement system for moving the panel along a feed direction parallel to the supporting table, comprising a tool unit movable in a straight line inclined with respect to the feed direction and lying in a work plane perpendicular to the supporting table and movable along a circular arc in the work plane. The machining unit comprises a parallelogram coupled to the tool unit and configured to guide the tool unit along the circular arc.

Fig. 1



EP 4 516 470 A1

Description

[0001] This invention relates to a machining unit for edge banding machines (also called edge banders), usable, in particular, for machining the edges of wooden panels or the like, on which a covering strip (or band), made preferably, but not necessarily, of a synthetic material is applied.

[0002] These panels made of wood, which may be solid wood or by-products thereof, such as chipboard, but which may also be made of plastic, are widely used to manufacture furniture, shelves and countertops, and come in different sizes and different section profiles, depending on market demands or on the specific use a panel is to be used for.

[0003] The line in which these panels are machined comprises what are known as "transfer machines", where a panel is advanced along several units or, as we will hereinafter call them, machining stations following one after another in succession. These machines are usually used to perform a certain number of processes, identical in the same batch, on large quantities of parts made for industry or for furniture.

[0004] In the context of this method, the large outside surfaces of the "rough" panel, especially if the panel is made of chipboard, are covered by an "ennobling" sheet in order to give it a surface finish having a fine aesthetic appearance, such sheets differing in colour and material depending on end use.

[0005] Once covered, the panels are cut to the required size.

[0006] Next, the panels are run through an edge banding station (hereinafter, the terms "edge banding station", "edge banding machine" and "edge bander" are used without distinction) in which a band or strip is applied to the edge of the panel which was left rough after the panel was cut. Each single panel may run through an edge banding station one or more times or it may run through several edge banding stations located one after another in order to cover all the edges of the panel that were left rough after the panel was cut. The band is applied so it projects outwards, since it is larger in area than the edge it is intended to cover so that it is sure to cover the edge of the panel entirely.

[0007] To obtain a panel which is also finished along the edge, therefore, further machining is necessary to cut the projecting parts of the band so that the band is exactly the same size as the edge of the panel. The machining process is carried out on the edge band in a station following the one in which the edge band was glued.

[0008] This finishing station may comprise two or more substations, each responsible for carrying out a specific machining process on the edge band. The expression "panel which is also finished along the edge" is used to mean that the edge of the panel is also provided with a surface finish having a fine aesthetic appearance.

[0009] Described below purely by way of example is a typical sequence of substations and machining processes performed on the edge band to make it the same size as the edge of the panel.

[0010] As it advances along a horizontal feed direction, which typically defines the axis X, or longitudinal axis, of the edge banding machine, the panel meets a first machining unit, comprising at least one tool which performs an operation known as end cropping, whereby the edge band is cropped to create sharp corners at its front and back ends so one of its dimensions is the same size as the panel edge, in particular so it is the same length. Next, the panel meets a second machining unit, comprising another tool which is adapted to perform an operation known as trimming, in which the excess parts along the top and bottom of the edge band are removed. After these machining processes, if the panel profile has sharp corners at the ends of it, the panel may proceed to a further station provided with panel finishing units which remove any minor burrs formed during the preceding machining processes.

[0011] If the panel profile is radiused on a half-part of the edge ends of it or is flat-angled, the panel is suitably machined in the edge banding station by contoured profile tools designed to copy the final radiused profile of the ends of the panel edge, at the front and back.

[0012] Since these machines, in their final configurations, are cumbersome and expensive, the trend followed by most constructors is, where possible, to reduce the dimensions of individual stations by eliminating operating elements and accessories in order to make the machine more economical, also as a function of the type of end product to be made.

[0013] This reduction can be achieved, for example, by composing multifunctional working units, especially with regard to the aforementioned end cropping, trimming and profiling operations.

[0014] For example, as shown in patent application EP0997245A2, a configuration comprising only two machining units, independent of each other and each comprising a single, motor-driven tool unit, provided with a corresponding panel edge copier, has been known for some time in the prior art. Each machining unit is associated with movement means for moving the tool unit. The movement means allow the tool unit to move along a straight line, inclined relative to the horizontal feed direction of the panel (axis X, or longitudinal axis, of the edge bander), and a curved line. That way, the tool unit may adopt two or more operating positions, always in contact with the same panel, so as to obtain a configuration in which the covering band copies the edge.

[0015] This solution, although on the one hand it reduces the number of machining units used, does not, on the other hand, reduce the operating dimensions of the machining units themselves (one above and one below), since each tool unit can run in a corresponding linear guide (associated with the straight line), which is relatively long, and the curved line is obtained by rotating the entire linear guide which carries the tool unit.

[0016] Furthermore, rotating the linear guide, which

means rotating the tool unit, involves moving large masses during travel along the curved line. These may lead to problems of motion dynamics, hence to imprecise machining results.

[0017] Moreover, rotating the linear guide, which means rotating the tool unit, causes the tool unit itself to change orientation. Thus, the copier used during travel along the curved line, which is necessarily circular in shape, has only one point of contact with the panel to be machined, and that point of contact changes during travel along the curved line itself. This may lead to imprecise copying of the panel edge, hence to imprecise machining results. In effect, it is possible to correctly position, i.e. to set the correct distance between, a point on the contact surface of the copier relative to the tool axis, but this means there may be imprecision in positioning between the tool axis and the other points of the contact surface of the copier.

[0018] After numerous studies, therefore, the Applicant has developed a panel edge machining unit that is even more reduced in size than the aforementioned solution, thanks to the use of machining units operating and structured in such a way as to be able to perform several machining processes on the panels, such as, for example, end cropping, trimming and profiling, with extremely reduced movements and moving small masses for each unit, but without lowering the standards of production speed per unit time and of end product quality.

[0019] The aim of this disclosure, therefore, is to provide a machining unit that overcomes the above mentioned disadvantages of the prior art.

[0020] In particular, this disclosure has for an aim is to provide a machining unit that is reduced in size.

[0021] Another aim of this disclosure is to propose a machining unit which, during its operation, moves parts having reduced masses.

[0022] Yet another aim of this disclosure is to provide a machining unit offering an end product of high quality.

[0023] These aims are fully achieved by the machining unit of this disclosure, as characterized in the appended claims.

[0024] In particular, the machining unit comprises a tool unit movable in a straight line inclined with respect to the feed direction of the panel to be machined. By "inclined" is meant that the straight line makes an angle, different from zero and less than 90 degrees, with the feed direction. Thus, the straight line has a component along the feed direction and a component along a direction perpendicular to the feed direction, in particular the vertical axis of the edge bander, called the axis Z, which typically coincides with the direction that defines the thickness of the panel to be machined. The straight line lies in the working plane of the machining unit, which is perpendicular to the panel supporting table and parallel to the edge to be machined. This linear movement enables the tool unit to machine the front side of the edge, that is, the first side of the edge that runs through the machining unit. Copying the front side of the edge to be machined is accomplished by a planar copier, that is to say, a copier that has a flat contact surface configured to come into contact with the panel, combined with a standard circular copier, that is, a copier having a circular contact surface. That way, the copier rests on the panel with a portion of its flat contact surface. Its weight is thus distributed and any vibrations of the tool unit are damped more effectively than in the case of single-point contact, thereby obtaining higher machining quality when machining the flat part of the front side of the panel.

[0025] Further, the tool unit is movable along a circular arc, that is to say the tool unit performs a circular trajectory. The circular arc also lies in the working plane. This movement enables machining of the rear side of the panel edge, that is, the side opposite the front side. In effect, the machining unit machines the panel in a continuous flow, that is, while the panel is moving. That means the tool unit has to follow the movement of the panel so it can machine the rear side as it leaves the machining unit. To follow the panel during this step in the machining process, linear movements may also be used, although these involve larger dimensions or the need to move parts which are more complex, hence heavier (of greater mass).

[0026] Moreover, since the tool unit is guided along the circular arc by a parallelogram, the tool unit remains oriented in the same direction as it travels along the curved trajectory, allowing the copier to copy with the same contact point. That means that, as in the case of machining the front side, the rear side of the edge to be machined can be copied using a planar copier, that is, a copier that has a flat contact surface configured to come into contact with the panel. That way, the copier rests on the panel with a portion of its flat contact surface. Its weight is thus distributed and any vibrations of the tool unit are damped more effectively than in the case of single-point contact, thereby obtaining higher machining quality.

[0027] When machining the corner of the panel, the tool unit uses a copier that is circular in shape to copy the profile of the corner. As already mentioned, during this step, the tool unit is guided by the parallelogram and its orientation remains unchanged while the corner is being machined. The contact point between the circular copier and the panel does not change. This avoids copying errors due to the unequal distances between the rotation axis of the spindle and the different points of the contact surface of the circular copier itself, errors which would be present if the contact point changed.

[0028] Furthermore, the parallelogram is particularly compact and light in weight compared to other means which might be used to guide and follow the movement of the tool unit for machining the rear side. Therefore, the solution is less cumbersome (hence less expensive) and offers better dynamic performance (hence higher end machining quality).

[0029] This and other features will become more apparent from the following description of a preferred em-

bodiment, illustrated purely by way of non-limiting example in the accompanying drawings, in which:

- Figure 1 shows a front view of the machining unit according to the invention in a first operating configuration while it machines a panel;
- Figure 2 shows a front view of the machining unit according to the invention in a second operating configuration while it machines a panel;
- Figure 3 shows a front view of the machining unit according to the invention in a third operating configuration while it machines a panel;
- Figure 4 shows a front view of the machining unit according to the invention in a fourth operating configuration while it machines a panel;
- Figure 5 shows a front view of the machining unit according to the invention in a fifth operating configuration; and
- Figure 6 shows a front view of two machining units according to the invention, as mounted in an edge banding machine, while each of them machines a respective panel.

[0030] In the drawings, identical reference numerals are used to denote analogous components.

[0031] Moreover, hereinafter in this disclosure, directional terms such as "right", "left", "front", "rear", "top", "bottom", "upper", "lower", "lateral" etc. are used with reference to the accompanying drawings. Since components and/or elements and/or embodiments of this invention may be positioned and/or operated in several different orientations, the directional terms are used solely by way of non-limiting examples.

[0032] Hereinafter in this disclosure, reference is made mainly to a machining unit coupled to an edge banding machine, without thereby limiting the scope of protection defined by the appended claims.

[0033] Edge banding machines typically comprise a supporting table S for supporting a panel P, and a movement system for moving the panel P along a feed direction F parallel to the supporting table S.

[0034] The movement system may, for example, consist of a bottom movement chain which also acts as a supporting table for the panel P (in addition to other supporting means in the case of large panels), and a top presser, whose function is to hold the workpiece firmly in contact with the bottom movement chain. The bottom movement chain, by rotating, moves the workpiece along the feed direction F.

[0035] The feed direction F defines the axis X of the edge banding machine, that is to say, the longitudinal axis of the machine, since edge banders typically are elongated in shape along that direction.

[0036] Thus, the axis X may be horizontal, like the supporting table S and the feed direction F.

[0037] The edge banding machine also has an axis Z, orthogonal to the supporting table S. The axis Z is therefore vertical.

[0038] The edge banding machine also has an axis Y which is orthogonal to the axis X and to the axis Z.

[0039] According to these references, the edge of the panel P which is edge banded and then machined is the edge which is perpendicular to the supporting table S and parallel to the plane XZ defined by the axes X and Z of the edge banding machine.

[0040] In particular, the edge of the panel P is normally machined on four sides: a front side, which is perpendicular to the supporting table S and is the first to meet the machining unit 1 in the feed direction F; a rear side, opposite the front side; a lower side, which is parallel to the supporting table S and faces the supporting table S itself; and an upper side, opposite the lower side. With reference to Figure 1, the machining unit 1 has a frame 2 configured to be coupled fixedly, for example by bolts or welding, to an edge banding machine (not shown in the drawings).

[0041] The frame 2 supports a linear guide 3, disposed along a straight line L inclined relative to the feed direction F and lying in a machining plane XZ perpendicular to the supporting table S. Since the linear movement is inclined relative to the feed direction F, the machining unit 1 is more compact than in the case where the linear movement is parallel to the feed direction F.

[0042] The linear guide 3 may be a prismatic guide comprising, for example, a linear track and one or more bearings that run on the track. The bearings might also be called shuttles or sliders.

[0043] The machining unit 1 also comprises a four-point linkage 4, in particular a parallelogram 4. The parallelogram 4 in turn comprises four rods, in particular, a first rod 41, a second rod 42, a third rod 43 and a fourth rod 44, hinged to each other to form the four-point linkage, in particular, the parallelogram 4.

[0044] The machining unit may also comprise a first actuator A1 coupled to the parallelogram 4 and configured to cause the parallelogram 4 to pass from a start configuration to an end configuration. The first actuator A1 may be, for example, an electric actuator (for example, a rotary motor or a linear motor), located at a hinge, or a pneumatic actuator (for example, a piston) located at and coupled to one of the four rods of the parallelogram 4, so as to rotate the rod about the axis of the hinge associated therewith. Purely by way of an example, with reference to Figure 1, the first actuator is represented as a piston coupled between the first rod 41 and the third rod 43 to make the third rod 43 rotate in both directions about the axis of the hinge connecting the first rod 41 and the third rod 43. Under the action of the first actuator A1, the parallelogram 4 may adopt several configurations, hence the first actuator A1 may cause the parallelogram 4 to pass from a start configuration to an end configuration.

[0045] The parallelogram 4 may be coupled to the linear guide 3 so it can run therein. For example, the parallelogram 4 may be coupled to the linear guide 3 at one or more bearings. In the case of more than one bearing, these can distribute the weight of the entire

kinematic chain they have to support, downstream of the prismatic guide. In particular, the parallelogram 4 may be coupled to the linear guide 3 by one of its four rods. For example, with reference to Figure 1, the parallelogram 4 is coupled to the linear guide 3 by the first rod 41.

[0046] Again with reference to Figure 1, the machining unit 1 may comprise a second actuator A2, coupled to the parallelogram 4 so as to move it along the straight line L. The movement of the parallelogram 4 along the straight line L is guided by the linear guide 3. The second actuator A2 may, for example, be coupled to the parallelogram 4 directly or through the bearing of the linear guide 3 or by other mechanical means. The second actuator A2 may be, for example, an electric actuator (for example, a rotary motor or a linear motor), or a pneumatic actuator (for example, a piston).

[0047] The machining unit 1 further comprises a tool unit 5. The tool unit 5 has the purpose of performing one or more machining processes on the edge of the panel P parallel to the machining plane XZ. Such machining processes may be, for example, end cropping, trimming and profiling.

[0048] The tool unit 5 is coupled to the parallelogram 4, for example, at one of its four rods. Purely by way of example, with reference to Figure 1, the tool unit 5 is coupled to the parallelogram 4 by the second rod 42. The tool unit 5 may be made in such a way that a portion of it is itself the second rod 42 of the parallelogram 4. In effect, the body of the tool unit 5 may have a contoured shape and two hinges to which another rod of the parallelogram 4 are respectively hinged. That way, the machining unit 1 is easier to mount and more economical.

[0049] The tool unit 5 comprises a tool 51, for example a milling cutter, in particular a contoured milling cutter, capable of performing the required machining processes on the edge of the panel P, and a third actuator A3 having the purpose of driving the tool 51 in rotation. The third actuator A3 may be, for example, an electrospindle.

[0050] The tool unit 5 further comprises four copiers having the purpose of guiding the tool 51 along one or more sides of the edge of the panel P to be machined. In particular, with reference to Figure 1, the tool unit 5 comprises a front copier 52, a rear copier 53, a lateral copier 54 and a top, or bottom, copier 55.

[0051] The lateral copier 54 is configured to come into contact with the edge of the panel P in such a way as to define the position of the tool unit 5 along the axis Y. Typically, the lateral copier 54 may be disc shaped.

[0052] The front copier 52 is configured to come into contact with the front side of the edge of the panel P in such a way as to guide the tool unit 5 along the front side. The front copier 52 may have a flat contact surface, which is the surface configured to come into contact with the front side of the edge of the panel P.

[0053] The rear copier 53 is configured to come into contact with the rear side of the edge of the panel P in such a way as to guide the tool unit 5 along the rear side. The rear copier 53 may have a flat contact surface, which is the surface configured to come into contact with the rear side of the edge of the panel P.

[0054] The rear copier 53 and the front copier 52 may be adjusted, that is, positioned relative to the axis of the tool 51, for example along the feed direction F, separately (for example. with respective guides and, where necessary, respective actuators) or jointly (for example, with a linkage that constrains the position of the first to the position of the second, and vice versa).

[0055] The top, or bottom, copier 55 is configured to come into contact with the upper, or lower, side of the edge of the panel P, depending on whether the machining unit 1 is mounted and configured inside the edge bander to machine the upper side or the lower side of the edge of the panel P, as shown, for example, in Figure 6. The top, or bottom, copier 55 is therefore configured to guide the tool unit 5, that is, the tool 51, along the upper, or lower, side. Typically, the top, or bottom, copier 55 may be a wheel which runs, rolls or slides along the upper, or lower, side of the edge of the panel P.

[0056] The operation of the machining unit 1 described above is as follows.

[0057] With reference to Figure 1, the panel P, supported on the supporting table S, moves along the feed direction F, in particular from left to right.

[0058] The panel P, during its horizontal movement, passes through the machining unit 1. As it passes through the machining unit 1, the front side of the edge of the panel P comes into contact with the front copier 52 of the tool unit 5. In particular, contact is made between the front side of the edge of the panel P and the flat contact surface of the front copier 52. Being a flat surface, contact between the front side of the edge of the panel P (which is also a flat surface) and the front copier 52 is distributed over a surface area, that is to say, it is not a single point. This distribution of the contact region has the effect of damping any vibrations of the tool unit 5, thus improving the quality of the machining process performed by the machining unit 1. Furthermore, the tool unit 5 is positioned correctly along the axis Y of the edge bander when the panel P is also in contact with the lateral copier 54. At this point, the panel P, as it moves in the feed direction F, pushes the tool unit 5. The tool unit 5, being restrained by the parallelogram 4, which is in turn restrained by the linear guide 3, is constrained to move along the straight line L, which has a component both along the feed direction F and along the axis Z of the edge bander. Noticeable in Figure 2 is the movement of the tool unit 5 along the straight line L under the pushing action of the passing panel P. In this step, the tool 51 machines the front side of the edge of the panel P. The machining process may be, for example, end cropping, or end cropping and profiling.

[0059] As shown, for example, in Figure 3, the tool, after reaching the end of its downward motion, starts machining the lower side of the edge of the panel P.

[0060] The tool unit 5 has thus moved along the straight line L from a start position to an end position.

[0061] In this step, the lower side of the panel P is in contact with the bottom copier 55, which guides the machining motion of the tool 51. The machining process may be, for example, trimming, or trimming and profiling.

[0062] The panel P runs on the bottom copier 55 through the machining unit 1, as shown, for example, in Figure 4.

[0063] With reference to Figure 5, once the lower side of the edge of the panel P has been completed, the parallelogram 4 passes from a start configuration to an end configuration under the pushing action of the first actuator A1. In passing from a start configuration to an end configuration, the parallelogram 4 guides the tool unit 5 along a circular arc C. During travel along the circular arc C, the orientation of the tool unit 5 does not change. Thus, it is possible to use as a rear copier, a copier having a flat contact surface, in combination with the circular surface of the bottom copier 55. During machining of the rear side of the panel P, the tool 51 is thus guided along the rear side by the rear copier 52, while the tool 51 travels along the circular arc C. In this step, the rear side of the edge of the panel P is in contact with the flat contact surface of the rear copier 53. Being a flat surface, contact between the rear side of the edge of the panel P (which is also a flat surface) and the rear copier 53 is distributed over a surface area, that is to say, it is not a single point. This distribution of the contact region has the effect of damping any vibrations of the tool unit 5, thus improving the quality of the machining process performed by the machining unit 1. During this step, the tool unit 5 machines the rear side of the edge of the panel. In particular, the machining process may be, for example, end cropping of the edge band, or end cropping and profiling.

[0064] Once machining of the rear side of the edge of the panel P is over, the first actuator A1 returns the parallelogram 4 to the start configuration. In addition, acting as one therewith along the straight line L, the second actuator A2 moves the parallelogram 4 and the tool unit 5 from the end position to the start position. The machining unit 1 is now ready to start machining the lower side and the rear side of the next panel P.

[0065] In order to machine all the sides of the edge of the panel P, that is, the front side, the rear side, the lower side, and the upper side, the edge bander must be provided with two machining units 1 suitably positioned and configured. For example, as shown in Figure 6, the edge bander may have a bottom machining unit 1, positioned substantially under the supporting table S. The expression "positioned substantially under" is used to mean that most of the mechanical components are located below the plane concerned, that is to say, they are fixed to the edge banding machine via the frame 2 at a level below the supporting table S. The bottom machining unit 1 is configured to machine the front side, the rear side and the lower side of the edge of the panel P in the machining plane XZ. Further, the edge bander may have a top machining unit 1, positioned substantially above the supporting table S. The expression "positioned substantially above" is used to mean that most of the mechanical components are located above the plane concerned, that is to say, they are fixed to the edge banding machine via the frame 2 at a level above the supporting table. The top machining unit 1 is configured to machine the front side, the rear side and the upper side of the edge of the panel P in the machining plane XZ. The panel P passes through both of the machining units, the bottom machining unit 1 and the top machining unit 1, so that all of its sides are correctly machined by the respective tool units 5. This invention has been described by way of non-limiting illustration with regard to its preferred embodiments but it is understood that variants and/or modifications can be made by experts in the trade without thereby departing from the scope of protection afforded by the claims appended hereto.

Claims

1. A machining unit (1) for an edge banding machine comprising a supporting table (S) for supporting a panel (P) and a movement system for moving the panel (P) along a feed direction (F) parallel to the supporting table (S), comprising a tool unit (5) movable in a straight line (L) inclined with respect to the feed direction (F) and lying in a work plane (XZ) perpendicular to the supporting table (S) and movable along a circular arc (C) in the work plane (XZ), the machining unit (1) being **characterized in that** it comprises a parallelogram coupled to the tool unit (5) and configured to guide the tool unit (5) along the circular arc (C).

2. The machining unit (1) according to claim 1, **characterized in that** it comprises a first actuator (A1) coupled to the parallelogram (4) and configured to cause the parallelogram (4) to pass from a start configuration to an end configuration.

3. The machining unit (1) according to claim 2, **characterized in that** the parallelogram (4) comprises four rods (41, 42, 43, 44) hinged to each other, and the first actuator (A1) is configured to cause one of the four rods (41, 42, 43, 44) to rotate in both directions about the axis of a respective hinge.

4. The machining unit (1) according to claim 3, **characterized in that** one of the four rods (41, 42, 43, 44) of the parallelogram coincides with a portion of the tool unit (5).

5. The machining unit (1) according to any one of the preceding claims, **characterized in that** it comprises a straight guide (3) coupled to the parallelogram (4) and configured to guide the parallelogram (4) and the tool unit (5) along the straight line (L), so that the tool unit (5) and the parallelogram (4) are

movable as one along the straight line (L).

6. The machining unit (1) according to claim 5, **characterized in that** it comprises a second actuator (A2) coupled to the parallelogram (4) and configured to move the tool unit (5) and the parallelogram (4) along the straight line (L).

7. The machining unit (1) according to any one of the preceding claims, **characterized in that** the tool unit (5) comprises a front copier (52) having a flat contact surface configured to guide the tool unit (5) along a front side of the edge of the panel (P), and a rear copier (53) having a flat contact surface configured to guide the tool unit (5) along a rear side of the edge of the panel (P), opposite the front side.

8. The machining unit (1) according to claim 7, **characterized in that** the tool unit (5) comprises a tool (51) having an axis of rotation, and **in that** the front copier (52) and the rear copier (53) are adjustable independently of each other relative to the axis of rotation of the tool (51).

9. An edge banding machine comprising a supporting table (S) for supporting a panel (P), a movement system for moving the panel (P) along a feed direction (F) parallel to the supporting table (S), and a machining unit (1) according to any one of the preceding claims, for machining an edge of the panel (P) in a work plane (XZ) perpendicular to the supporting table (S), while the panel (P) moves along the feed direction (F).

10. The edge banding machine according to claim 9, **characterized in that** it comprises a lower machining unit (1) disposed and configured in such a way as to machine a lower side of the edge of the panel (P), which is parallel to the supporting table (S) and faces the supporting table (S), and an upper machining unit (1) disposed and configured in such a way as to machine an upper side of the edge of the panel (P), opposite the lower side of the edge of the panel (P).

11. A method for machining an edge of a panel (P) by means of a machining unit (1) of an edge banding machine comprising a supporting table (S) for supporting a panel (P), and a movement system for moving the panel (P) along a feed direction (F) parallel to the supporting table (S), the method comprising the following steps:

- moving the panel (P) along the feed direction (F) through the machining unit (1);
- moving a tool unit (5) of the machining unit (1) in a straight line (L) inclined with respect to the feed direction (F) and lying in a work plane (XZ) perpendicular to the supporting table (S), so as to machine a front side of the edge of the panel (P);
- moving the tool unit (5) along a circular arc (C) in the work plane (XZ) so as to machine a rear side of the edge of the panel (P), opposite the front side; and
- guiding the tool unit (5) along the circular arc (C) by means of a parallelogram (4) coupled to the tool unit (5) while the preceding step is being carried out.

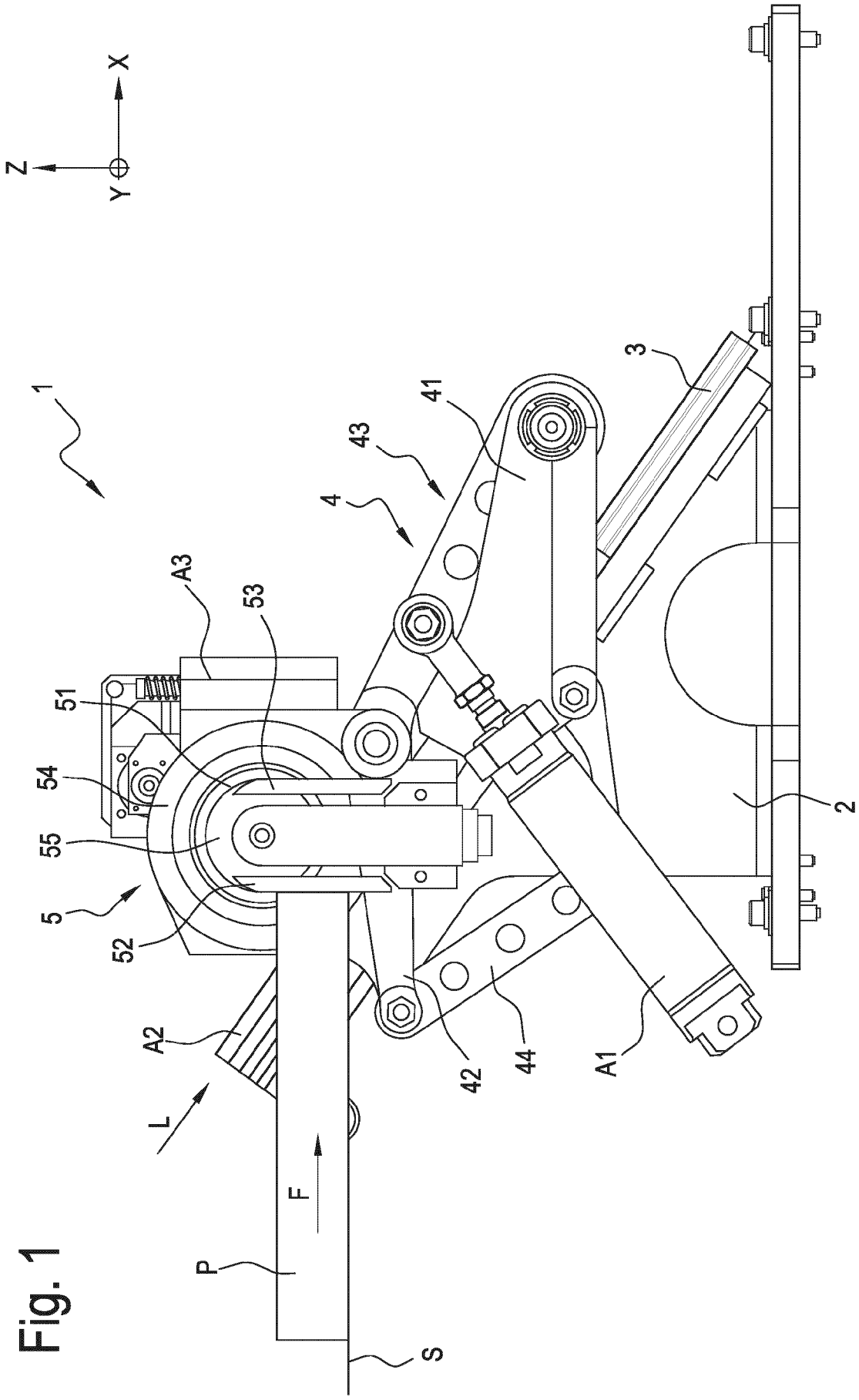


Fig. 1

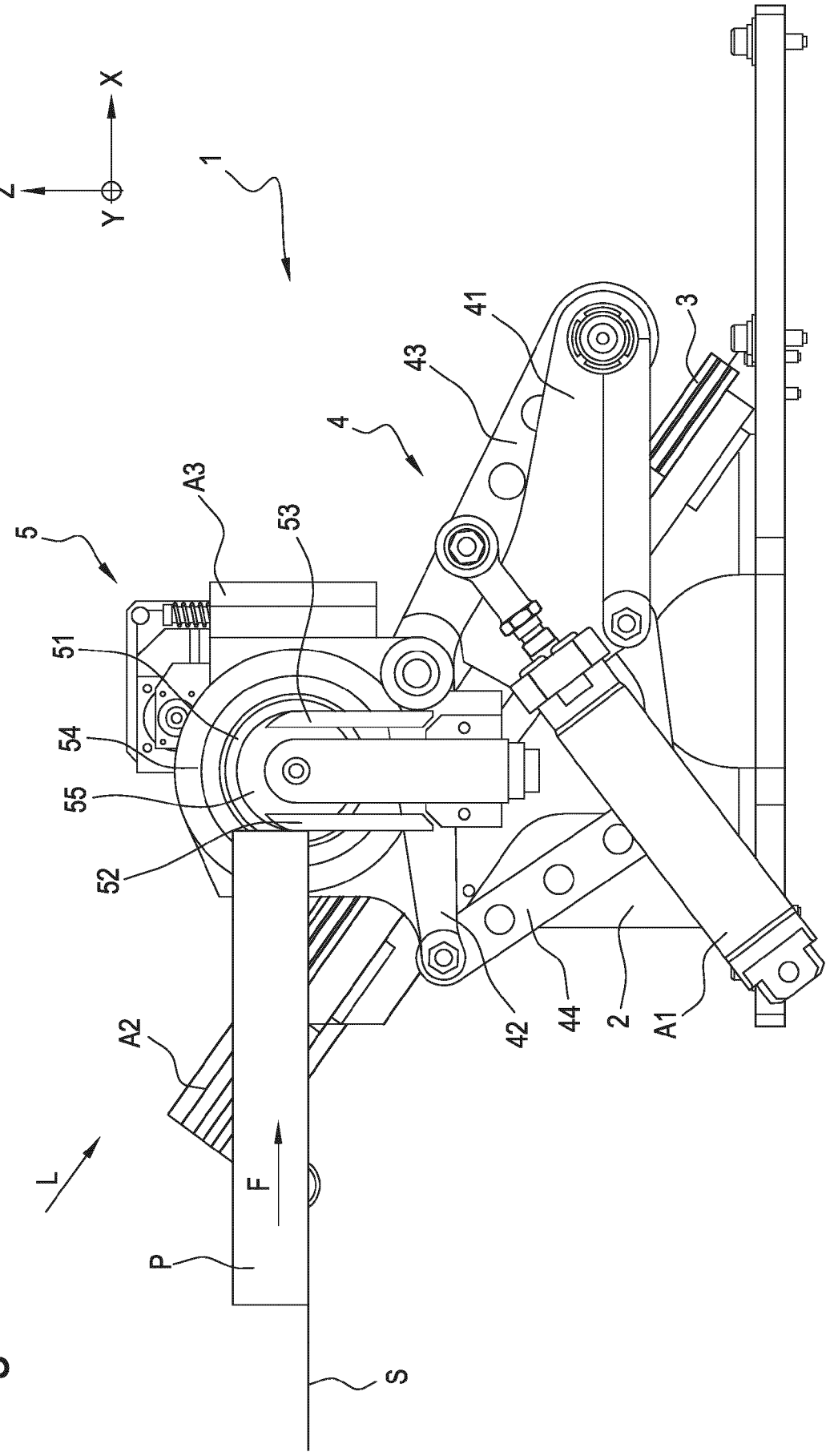


Fig. 2

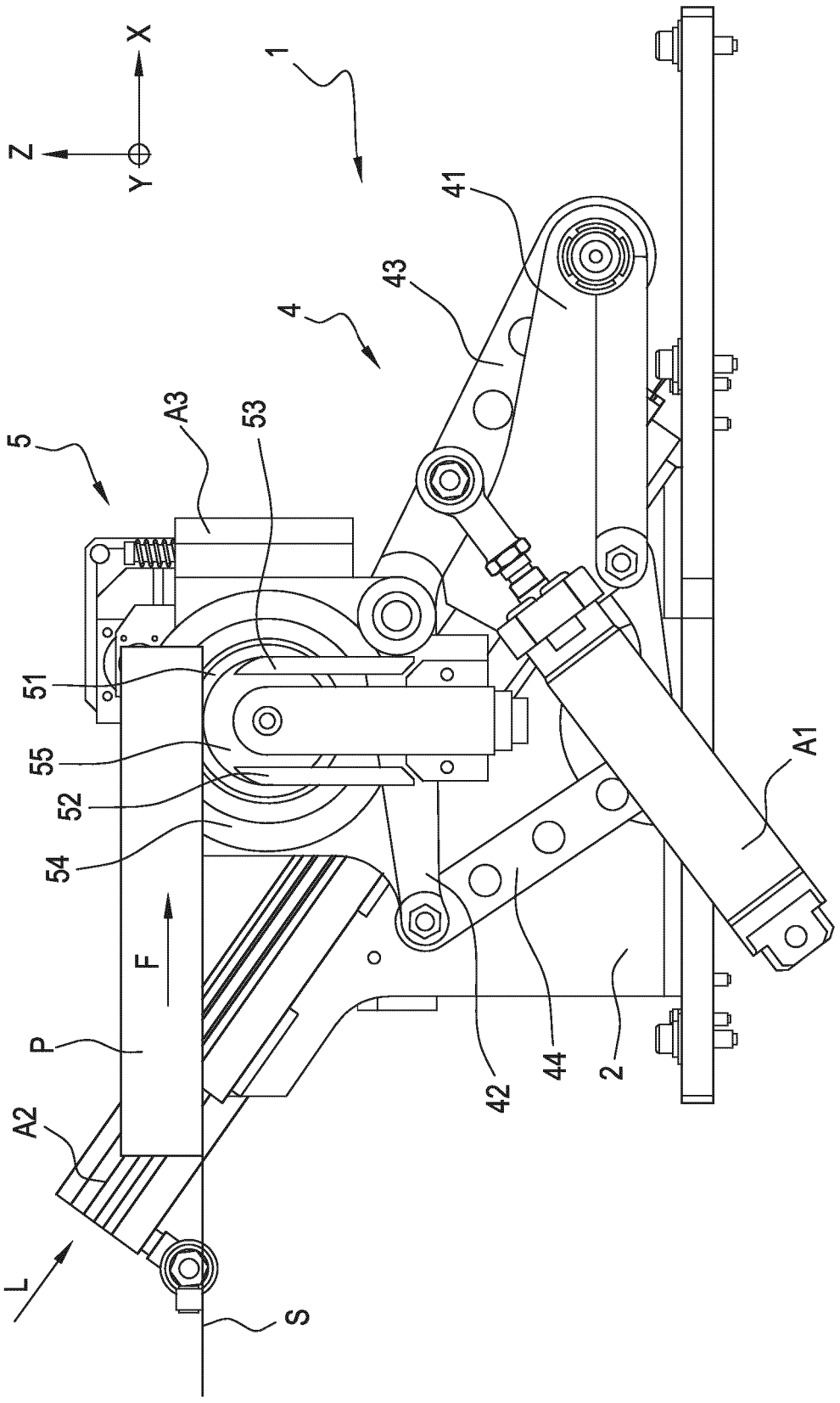


Fig. 3

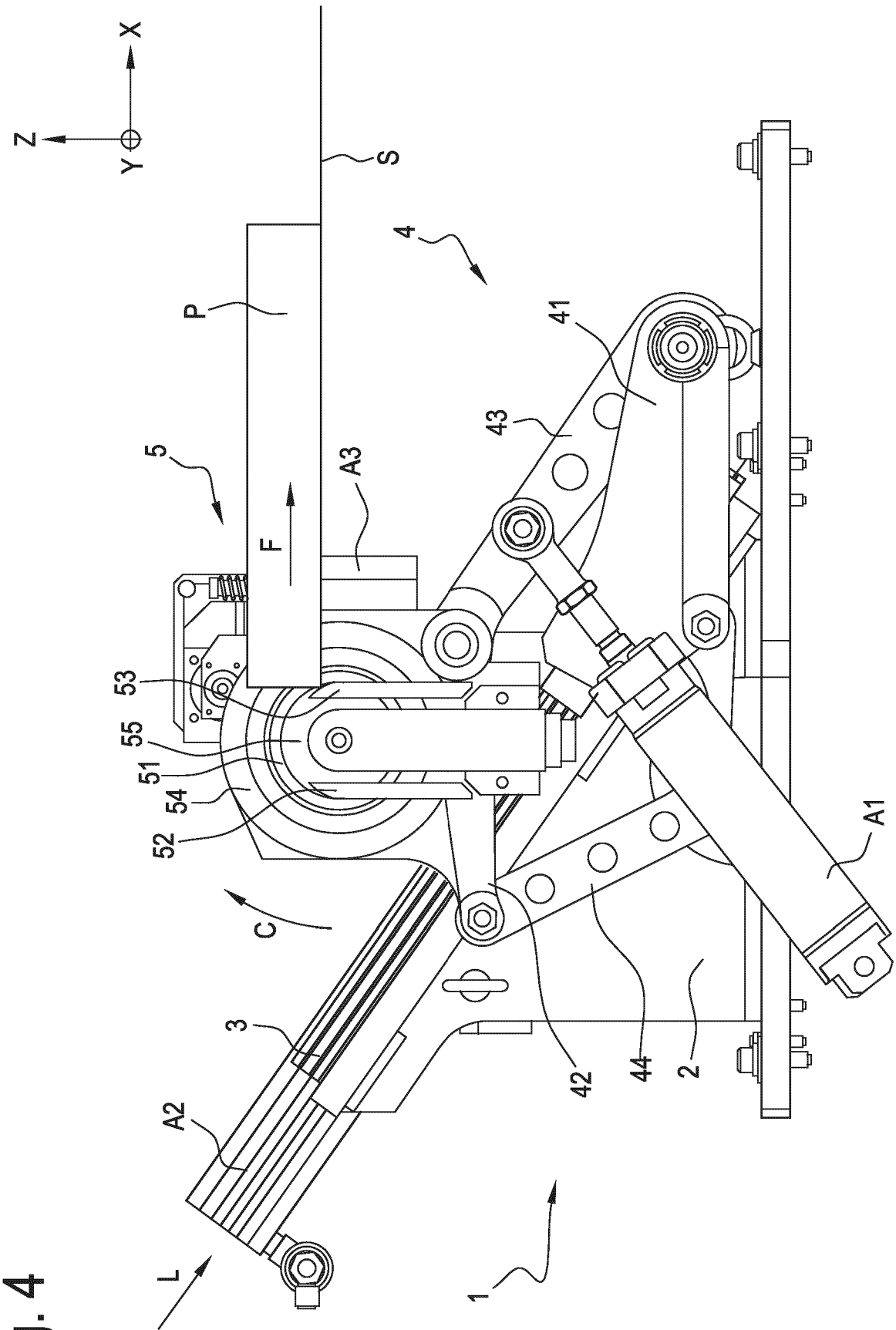


Fig. 4

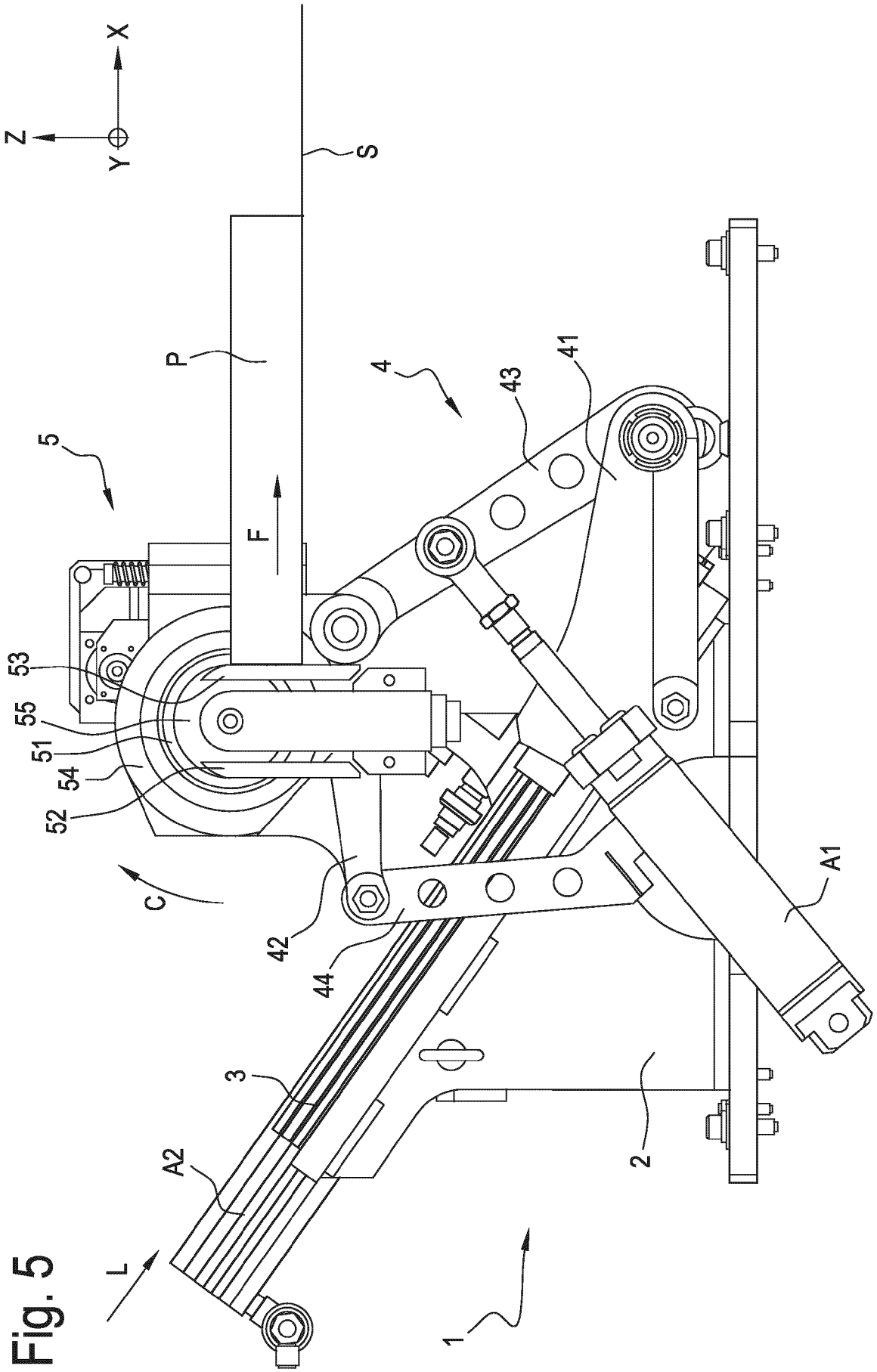


Fig. 5

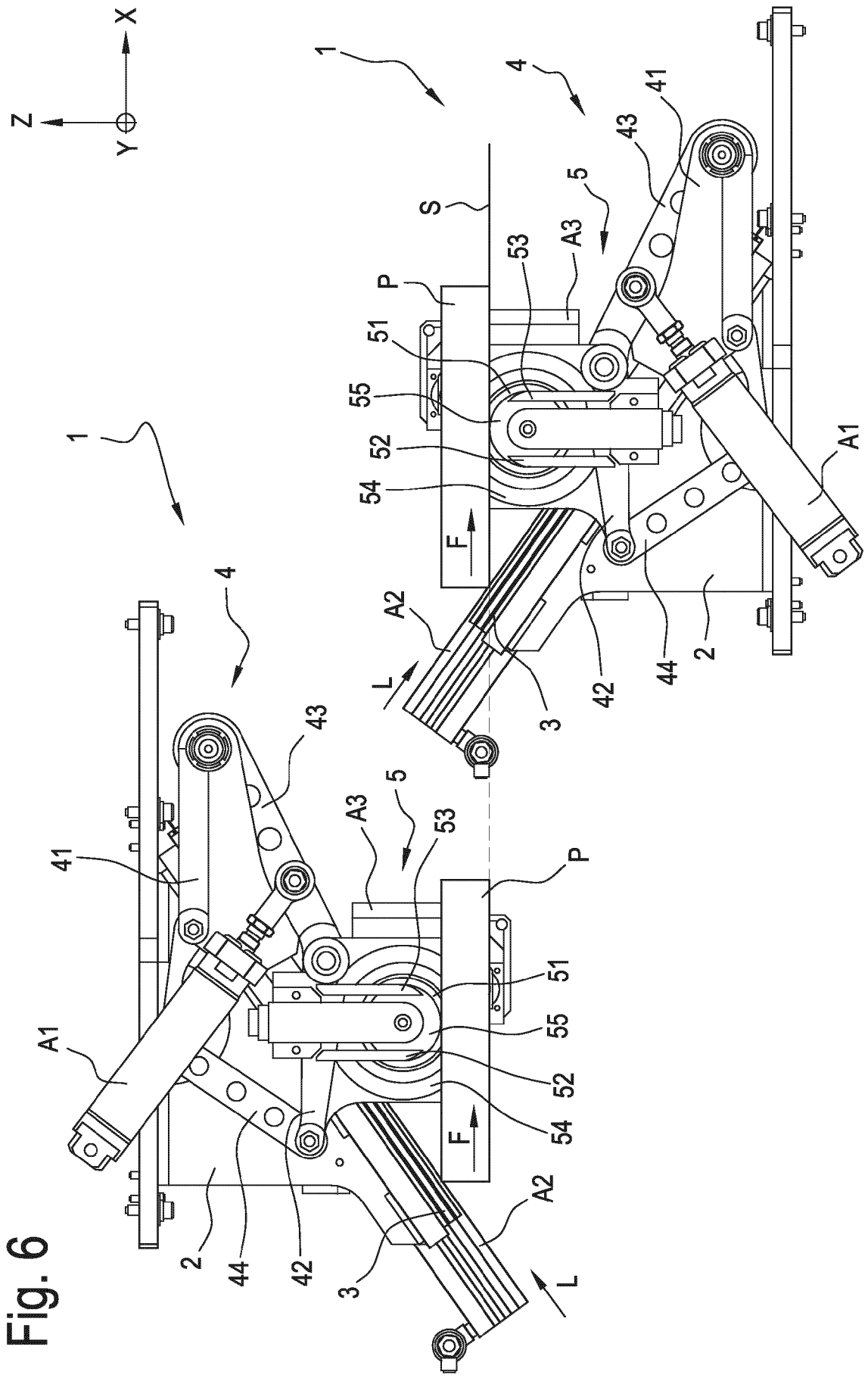


Fig. 6

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Application Number
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