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(71) Applicant: **SCM Group S.p.A.**
47921 Rimini (RN) (IT)

(72) Inventor: **ROSSI, Marco**
47921 RIMINI (IT)

(74) Representative: **Tiburzi, Andrea et al**
Barzanò & Zanardo Roma S.p.A.
Via Piemonte 26
00187 Roma (IT)

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(54) **MACHINE TOOL**

(57) The present invention relates to a machine tool (1) for performing at least one machining operation on at least one panel (P) or on an edge (B) present on at least one panel (P); said at least one panel (P) being provided with a label (E) containing at least one information concerning the material said at least one panel (P) is made of; said machine tool (1) comprising: first moving means (4) to move, according to an advancement direction (A), at least one panel (P) or at least one panel (P) on which an edge (B) is present; at least one first operative assembly (6) comprising: operative means (8) to perform, while in use, at least one machining operation on said at least one panel (P) or on said edge (B) at least one first side of said at least one panel (P); at least one abutment element (12) which is movable according to an axis (X), parallel to said advancement direction (A), and placed in such a way as to come into contact, while in use, with

said at least one panel (P) advancing along said advancement direction (A); said at least one abutment element (12) being configured to operate, while in use, as a reference for performing said at least one machining operation on said at least one panel (P) or on said edge (B) by said operative means (8); and second moving means (14) to move, along said axis (X), said at least one abutment element (12). Said machine tool (1) also comprises a detecting device (18) placed upstream of said at least one abutment element (12) according to said advancement direction (A) and configured to detect, while in use, said at least one information present in said label (E); and a control unit (19) operatively connected to said detecting device (18) and to said second moving means (14) and configured to control the operation of said second moving means (14) based on said at least one information detected by said detecting device (18).

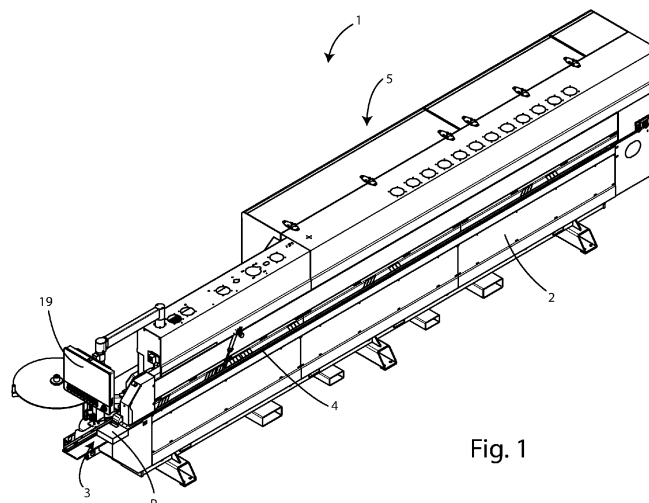


Fig. 1

Description

[0001] The present invention relates to a machine tool.

[0002] More in detail, the invention relates to a machine tool for performing at least one machining on panels or edges present on wooden panels, for example, honey-comb, chipboard or MDF panels.

[0003] In the following, the description will be addressed to the machining of wooden panels, but it is clear that it should not be considered limited to this specific use, as it can also extend to the machining of panels made of other materials.

[0004] The machine tool according to the present invention can be part of a more complex machine, normally indicated with the term "edge banding machine".

[0005] Normally, edge banding machines (as well as so-called "squaring-edge banding" machines) comprise a station for applying on one face of the panel an excess edge on two opposite sides of the panel perpendicular to this face and, downstream of this station, a trimming station to cut the two excess portions of the edge (i.e. the two portions of the edge that exceed the opposite sides of the panel) flush with the aforementioned sides of the panel.

[0006] In particular, the aforementioned trimming station includes, among other things, cutting members and a feeler (also called "copier") associated with each cutting member, which feeler is intended to come into contact with the panel, acting in this way as a reference member for the execution of the edge cutting operations.

[0007] Normally, the cutting of the edge occurs following the contact between the panel and a feeler, while the latter two advance, in an integral way, according to a predetermined advancement direction.

[0008] The force that the feeler and the panel exchange to maintain mutual contact during cutting by the relevant cutting member is also called the "copying force".

[0009] If the contact between the feeler and the panel does not occur correctly or is not sufficiently stable, there is the possibility that the panel can move with respect to its correct position, defined by the edge banding machine, and/or that vibrator phenomenon occurs between the feeler and the panel, with the consequent risk of poor quality edge cuts.

[0010] It is therefore of fundamental importance that the copying force is adequate with respect to the nature of the panel to be machined.

[0011] Traditionally, the copying force that the feeler exerts on the panel is generated by compressing a preloaded spring interposed between the feeler and the motor used to advance the cutting member and the relative feeler according to the advancement direction.

[0012] If it is desired to cut, by means of the last type of edge banding machines, the edges applied on panels of different nature (i.e., of different material), it would be necessary to vary from time to time the preload of the aforementioned spring, always to obtain a stable contact

between the feeler and each panel, without damaging the panel itself.

[0013] The operations necessary to obtain a variation of the spring preload obviously involve execution times of a certain amount, also due to the fact of having to proceed with the disassembly and subsequent reassembly of several parts of the edge banding machine.

[0014] This results in long periods of inactivity of the edge banding machine, which must necessarily be switched off or at least kept inactive during the execution of the aforementioned operations for the variation of the spring preload.

[0015] In light of the above, it is, therefore, an object of the present invention providing a machine tool for cutting an edge on a panel, which allows to automatically cut edges applied on panels of different nature.

[0016] Another object of the invention is to provide a machine tool for cutting an edge present on a panel, which allows the edges applied on the panels to be cut with high precision.

[0017] A further object of the present invention is to provide a machine tool for cutting an edge on a panel, which allows the edges applied to the panels to be cut without damaging in any way the latter.

[0018] Another object of the present invention is to provide a machine tool that is able to perform at least one machining on a panel or an edge present on a panel, with high precision and automatically according to the material of which this panel is made.

[0019] It is, therefore, specific object of the present invention a machine tool for performing at least one machining operation on at least one panel or on an edge present on at least one panel; said at least one panel being provided with a label containing at least one information concerning the material said at least one panel is made of; said machine tool comprising: first moving means to move, according to an advancement direction, at least one panel or at least one panel on which an edge is present; at least one first operative assembly comprising: operative means to perform, while in use, at least one machining operation on said at least one panel or on said edge at least one first side of said at least one panel; at least one abutment element which is movable according to an axis, parallel to said advancement direction, and placed in such a way as to come into contact, while in use, with said at least one panel advancing along said advancement direction; said at least one abutment element being configured to operate, while in use, as a reference for performing said at least one machining operation on said at least one panel or on said edge by said operative means; and second moving means to move, along said axis, said at least one abutment element; characterized in that it also comprises a detecting device placed upstream of said at least one abutment element according to said advancement direction and configured to detect, while in use, said at least one information present in said label; and a control unit operatively connected to said detecting device and to said second mov-

ing means and configured to control the operation of said second moving means based on said at least one information detected by said detecting device.

[0020] Preferably according to the invention, said operative means are movable according to said axis.

[0021] Further according to the invention, said operative means may comprise cutting means.

[0022] Advantageously according to the invention, said second moving means may comprise a motor, and said control unit may be configured to regulate the torque of said motor based on said at least one information detected by said detecting device in such a way as to regulate the contact force between said at least one abutment element and said at least one panel.

[0023] Still according to the invention, said motor may be a rotary motor and in that said second moving means comprise a transmission system comprising a belt and connected to said motor.

[0024] Preferably according to the invention, said operative means may comprise a cutting member and actuating means for moving said cutting member according to a cutting direction, lying on a plane substantially orthogonal to said advancement direction in such a way as to cut a portion of said edge, protruding from a first side of said panel.

[0025] Conveniently according to the invention, said at least one abutment element and said operative means may be movable integrally with each other according to said axis.

[0026] Preferably according to the invention, said first moving means may comprise a conveyor belt and/or a roller conveyor.

[0027] Further according to the invention, said machine may comprise at least one second operative assembly comprising: operative means to perform, while in use, at least one machining operation on said at least one panel or on said edge at least one second side of said at least one panel, opposite to said at least one first side; at least one abutment element which is movable according to said axis and placed in such a way as to come into contact, while in use, with said at least one panel; said at least one abutment element of said at least one second operative assembly being configured to operate, while in use, as a reference for performing said at least one machining operation on said at least one panel or on said edge by said operative means of said at least one second operative assembly; and second moving means to move, along said axis, said at least one abutment element of said at least one second operative assembly; wherein said control unit is operatively connected to said second moving means of said at least one second operative assembly and configured to control the operation of said second moving means of said at least one second operative assembly based on said at least one information detected by said detecting device.

[0028] Preferably according to the invention, said operative means of said at least one second operative assembly may be movable according to said axis.

[0029] Further according to the invention, said second moving means of said at least one second operative assembly may comprise a motor and said control unit may be configured to regulate the torque of said motor of said at least one second operative assembly based on said at least one information detected by said detecting device.

[0030] Still according to the invention, said motor of said at least one second operative assembly is a rotary motor, and said second moving means of said at least one second operative assembly may comprise a transmission system comprising a belt and connected to said motor of said at least one second operative assembly.

[0031] Conveniently according to the invention, said at least one abutment element of said at least one second operative assembly and said operative means of said at least one second operative assembly may be movable integrally with each other according to said axis.

[0032] Preferably according to the invention, said operative means of said at least one second operative assembly may comprise a cutting member and actuating means for moving said cutting member according to a cutting direction, lying on a plane substantially orthogonal to said advancement direction, in such a way as to cut a portion of said edge, protruding from a second side of said panel opposite to said first side.

[0033] Further according to the invention, said machine may comprise application means for applying an edge on at least one panel, said application means being placed upstream of said at least one first operative assembly.

[0034] The present invention will be now described, for illustrative but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figure 1 shows, as a whole, a machine tool for cutting an edge present on a panel according to an embodiment of the present invention, during a first operating step;

figure 2 is a detailed isometric view extracted from figure 1, during a first operating step of the machine tool;

figure 3 is an axonometric view of an assembly of the machine tool in figures 1 and 2, during a second operating step;

figure 4 is an axonometric view of the same assembly during a third operating step; and

figure 5 is an axonometric view of the aforesaid assembly during a fourth operating step.

[0035] In the various figures, similar parts will be indicated with the same numerical references.

[0036] Referring to figures 1-5, with 1 it is indicated a machine tool for cutting an edge present on wooden panels (or other material).

[0037] This machine tool 1 comprises a frame 2, in which an inlet area 3 is defined for the insertion of the

panels P to be machined.

[0038] Specifically, on each of said panels P there is applied an edge B, on a face of the panel P facing one side of the same machine tool 1, and a label E on the upper face of the panel P.

[0039] More in detail, the edge B present on each panel P is such as to protrude at both opposite sides of the panel P orthogonal to the face on which the edge B is applied.

[0040] The label E contains information on the nature (preferably, on the composition or on the material) of the panel P, on which it is applied.

[0041] For example, a barcode incorporating the above information can be printed on the label E.

[0042] The machine tool 1 also comprises a conveyor belt 4, and/or a roller plane, for advancing, according to an advancement direction A, each panel P arranged in the inlet area 3.

[0043] A position adjacent to the conveyor belt 4 is provided for a cutting station 5 to carry out the end milling of the edge B on each panel P, i.e., to cut the edge B flush with the aforementioned opposite sides of the panel P orthogonal to the face on which the edge B itself is applied, thus eliminating the relative two excess portions.

[0044] In turn, the cutting station 5 comprises a first end trimming unit 6 and a second end trimming unit 7 arranged, respectively, in a proximal position and in a distal position with respect to the inlet area 3.

[0045] In particular, the first end trimming unit 6 is responsible for cutting the portion of the edge B protruding from the side of the panel P closest to the cutting station 5; while the second end trimming unit 7 is designed to cut the portion of the edge B protruding from the side of the panel P, farther away from the cutting station itself 5.

[0046] More specifically, the first end trimming unit 6 includes a cutting unit 8 comprising a cutting blade 9, a motor to allow its actuation or to rotate the cutting blade 9 on itself, and an actuator 10 (for example, a pneumatic actuator) to move, also by means of a respective guide 11, the aforesaid cutting blade 9 according to a cutting direction T, orthogonal to a plane parallel to said advancement direction A, and perpendicular to the top surface of the conveyor belt 4.

[0047] The first end trimming unit 6 also comprises an abutment member 12 facing the area 3 or towards the panel P arranged therein.

[0048] Said first end trimming unit 6 is mounted on a track 13 oriented parallel to the advancement direction A.

[0049] In the cutting station 5, a first movement system 14 is also provided for moving the first end trimming unit 6 along an axis X, parallel to the advancement direction A, in particular in both opposite directions, defined by the same axis X.

[0050] More particularly, the first movement system 14 includes a motor 15 (preferably a brushless motor), and a transmission system 16, provided with a toothed belt 17, to convert the rotary motion of the motor 15 into a rectilinear movement of the first end trimming unit 6 ac-

cording to the aforementioned X axis.

[0051] The second end trimming unit 7 comprises the same elements indicated above with respect to the first end trimming unit 6, but the feeler member (not visible in the attached figures) of the second end trimming unit 7 faces in the opposite direction with respect to the abutment member 12 of the first end trimming unit 6.

[0052] Also, a group 18 is mounted on the frame 2, arranged between the inlet area 3 and the cutting station 5 and facing downwards, in such a way as to scan the label E applied to the top surface of each panel P when the latter passes under it during its advancement path according to the advancement direction A (see figure 2).

[0053] The scanning of the label E allows the scanner 18 to acquire the information reported therein about the nature of the panel P, on which this label E is applied.

[0054] The machine tool 1 also comprises a logic control unit 19, configured to receive the information acquired by the scanner 18 and consequently controlling the displacements of the first end trimming unit 6 and of the second end trimming unit 7.

[0055] The aforementioned control logic unit 19, the scanner 18, the first end trimming unit 6, and the second end trimming unit 7 are operationally connected between of them.

[0056] The machine tool 1 can also comprise a station of a known type for applying the aforementioned edge B on the panel P by gluing, arranged upstream of the cutting station 5.

[0057] According to further variants of the present invention, the cutting station 5 described above can be replaced with a generic operating station for the execution of a machining, even if different from cutting (for example, rounding, trimming, grinding, or polishing), on the edge B or on the panel P itself.

[0058] The operation of the machine tool 1 described above is as follows.

[0059] When the aforementioned panel P is arranged in the inlet area 3 with the label E facing upwards and with the edge B facing the same side occupied by the cutting station 5, the scanner 18 scans this label E, acquiring the information contained therein, and to transmit this information to the control logic unit 19 (see figure 2).

[0060] From the inlet area 3 the panel P is made to advance according to the advancement direction A by the conveyor belt 4 (see figure 3).

[0061] When the panel P reaches the proximity of the first end trimming unit 6, the logic control unit 19 commands the motor 15 to move the first end trimming unit 6 along the X axis, in a direction concordant with the advancement direction A, to achieve the contact between the abutment member 12 and the panel P itself.

[0062] Specifically, for the aforementioned movement of the first end trimming unit 6, the control logic unit 19 determines the maximum drive torque with which the motor 15 must operate on the basis of the aforementioned information acquired from the label E by the scanner 18.

[0063] For example, in case of the information con-

tained in the label E shows that the relative panel P is composed of a relatively delicate material (for example, honeycomb), the logic control unit 19 will set, for the operation of the motor 15, a maximum driving torque, such as not to damage the panel P following its contact with the abutment member 12.

[0064] By adjusting the driving torque of the motor 15, therefore, the intensity of the copying force or the contact force between the abutment member 12 and the panel P.

[0065] Once the first end trimming unit 6 and the panel P reach the same advancement speed according to the advancement direction A, and that the contact between the latter two has stabilized, the control logic unit 19 commands the actuator 10 to advance the cutting blade 9 according to the cutting direction T, to cut the portion of the edge B protruding from the side (also called "head") of the panel P, closest to the cutting station 5 while the first end trimming unit 6 and the panel P move at the same speed along said advancement direction A.

[0066] When the same panel P reaches the second end trimming unit 7, the logic control unit 19 controls the latter according to the same methods described above, in relation to the first end trimming unit 6, in such a way that said second end trimming unit 7 cuts the portion of the edge B protruding from the other side (also called "tail") of panel P, namely the side of this farthest from the cutting station 5 when the panel P is in the entrance area 3.

[0067] As can be seen from the above description, the tool according to the present invention makes it possible to effectively cut the excess portions of the edge B applied on each panel P automatically, according to the nature or the structural characteristics of each panel P to be machined, allowing obtaining precise cuts of the edge B, and avoiding the damage to the surfaces of the panel P intended to come into contact with the abutment members of the machine tool itself.

[0068] The machine tool proposed here, therefore, has the advantage of having an automatic adjustment of the copying force between the abutment members and the panel, without the need to provide this adjustment manually according to the nature of the panels to be machined.

[0069] The present invention has been described for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that modifications and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

Claims

1. Machine tool (1) for performing at least one machining operation on at least one panel (P) or on an edge (B) present on at least one panel (P); said at least one panel (P) being provided with a label (E) containing at least one information concerning the ma-

terial said at least one panel (P) is made of; said machine tool (1) comprising:

- first moving means (4) to move, according to an advancement direction (A), at least one panel (P) or at least one panel (P) on which an edge (B) is present;
- at least one first operative assembly (6) comprising:

- operative means (8) to perform, while in use, at least one machining operation on said at least one panel (P) or on said edge (B) at least one first side of said at least one panel (P);
- at least one abutment element (12) which is movable according to an axis (X), parallel to said advancement direction (A), and placed in such a way as to come into contact, while in use, with said at least one panel (P) advancing along said advancement direction (A); said at least one abutment element (12) being configured to operate, while in use, as a reference for performing said at least one machining operation on said at least one panel (P) or on said edge (B) by said operative means (8); and
- second moving means (14) to move, along said axis (X), said at least one abutment element (12);

characterized in that it also comprises

a detecting device (18) placed upstream of said at least one abutment element (12) according to said advancement direction (A) and configured to detect, while in use, said at least one information present in said label (E); and a control unit (19) operatively connected to said detecting device (18) and to said second moving means (14) and configured to control the operation of said second moving means (14) based on said at least one information detected by said detecting device (18).

2. Machine tool (1) according to claim 1, **characterized in that** said operative means (8) are movable according to said axis (X).

3. Machine tool (1) according to claim 1 or 2, **characterized in that** said operative means comprise cutting means (8).

4. Machine tool (1) according to any one of preceding claims, **characterized in that** said second moving means (14) comprise a motor (15) and **in that** said control unit (19) is configured to regulate the torque of said motor (15) based on said at least one infor-

mation detected by said detecting device (18) in such a way as to regulate the contact force between said at least one abutment element (12) and said at least one panel (P).

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5. Machine tool (1) according to claim 4, **characterized in that** said motor (15) is a rotary motor and **in that** said second moving means (14) comprise a transmission system (16) comprising a belt (17) and connected to said motor (15).

6. Machine tool (1) according to any one of preceding claims, **characterized in that** said operative means (8) comprise a cutting member (9) and actuating means (10) for moving said cutting member (9) according to a cutting direction (T), lying on a plane substantially orthogonal to said advancement direction (A) in such a way as to cut a portion of said edge (B), protruding from a first side of said panel (P).

7. Machine tool (1) according to any one of preceding claims, **characterized in that** said at least one abutment element (12) and said operative means (8) are movable integrally with each other according to said axis (X).

8. Machine tool (1) according to any one of preceding claims, **characterized in that** said first moving means comprise a conveyor belt (4) and/or a roller conveyor.

9. Machine tool (1) according to any one of preceding claims, **characterized in that** it comprises at least one second operative assembly (7) comprising:

- operative means to perform, while in use, at least one machining operation on said at least one panel (P) or on said edge (B) at least one second side of said at least one panel (P), opposite to said at least one first side;
- at least one abutment element which is movable according to said axis (X) and placed in such a way as to come into contact, while in use, with said at least one panel (P); said at least one abutment element of said at least one second operative assembly (7) being configured to operate, while in use, as a reference for performing said at least one machining operation on said at least one panel (P) or on said edge (B) by said operative means of said at least one second operative assembly (7); and
- second moving means to move, along said axis (X), said at least one abutment element of said at least one second operative assembly (7);

wherein said control unit (19) is operatively connected to said second moving means of said at least one second operative assembly (7) and configured to

control the operation of said second moving means of said at least one second operative assembly (7) based on said at least one information detected by said detecting device (18).

10. Machine tool (1) according to claim 9, **characterized in that** said operative means of said at least one second operative assembly (7) are movable according to said axis (X).

11. Machine tool (1) according to claim 10, **characterized in that** said second moving means of said at least one second operative assembly (7) comprise a motor, and **in that** said control unit (19) is configured to regulate the torque of said motor of said at least one second operative assembly (7) based on said at least one information detected by said detecting device (18).

12. Machine tool (1) according to claim 11, **characterized in that** said motor of said at least one second operative assembly is a rotary motor and **in that** said second moving means of said at least one second operative assembly (7) comprise a transmission system comprising a belt and connected to said motor of said at least one second operative assembly (7).

13. Machine tool (1) according to any one of claims 9 to 12, **characterized in that** said at least one abutment element of said at least one second operative assembly (7) and said operative means of said at least one second operative assembly (7) are movable integrally with each other according to said axis (X).

14. Machine tool (1) according to any one of claims 9 to 13, **characterized in that** said operative means of said at least one second operative assembly (7) comprise a cutting member and actuating means for moving said cutting member according to a cutting direction, lying on a plane substantially orthogonal to said advancement direction (A), in such a way as to cut a portion of said edge (B), protruding from a second side of said panel (P) opposite to said first side.

15. Machine tool (1) according to any one of preceding claims, **characterized in that** it comprises application means for applying an edge (B) on at least one panel (P), said application means being placed upstream of said at least one first operative assembly (6).

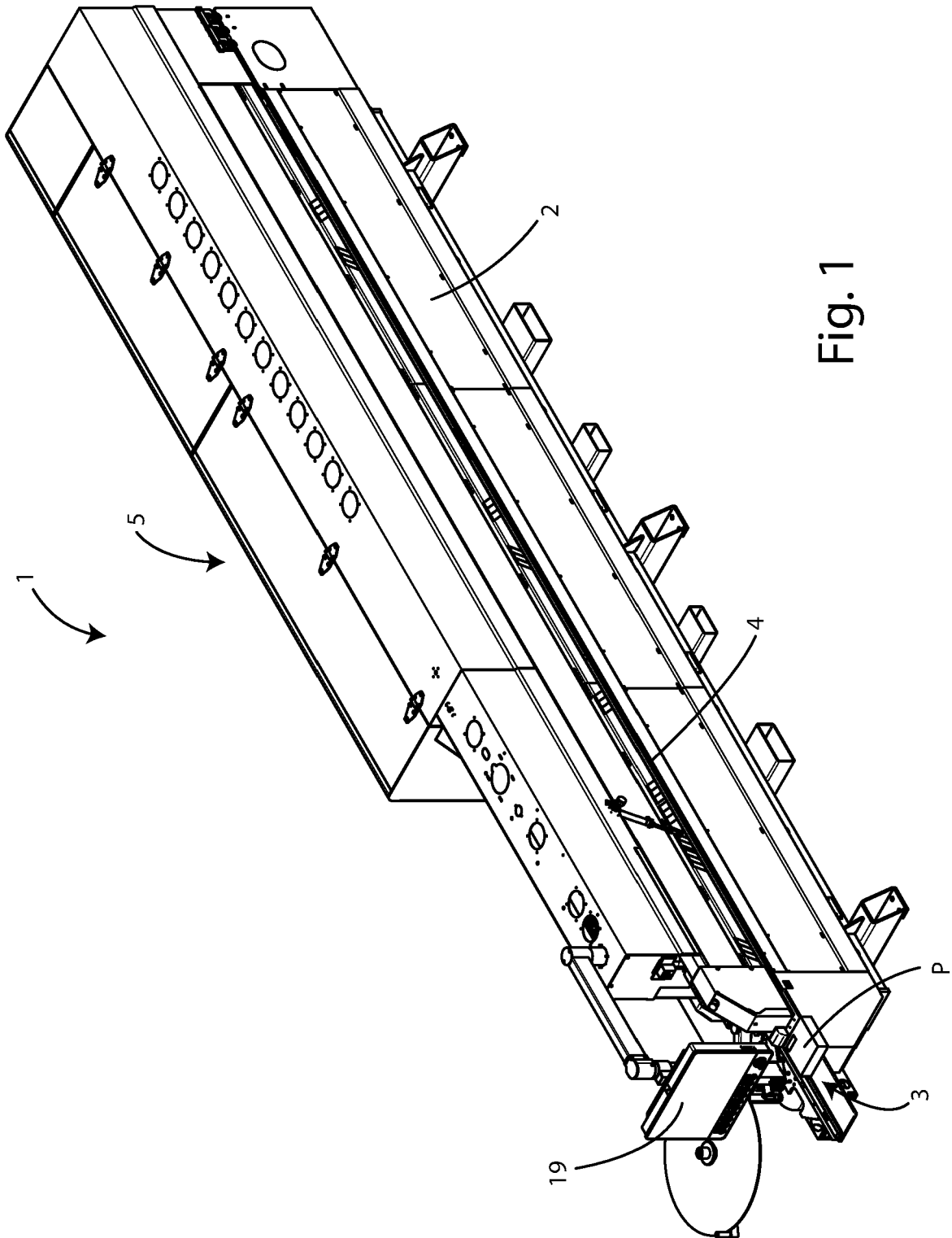


Fig. 1

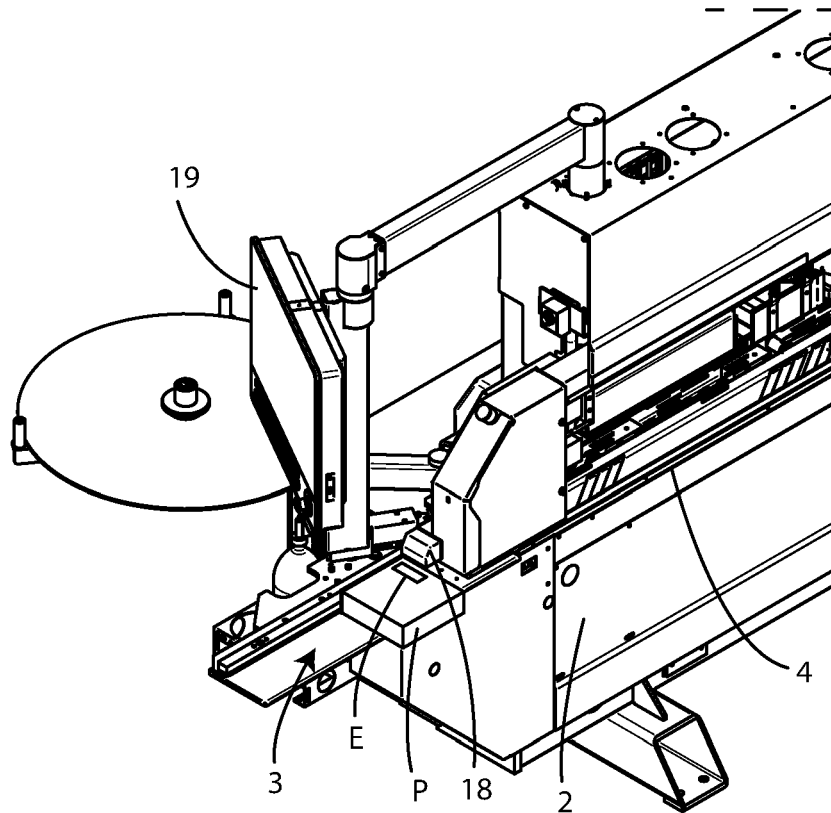


Fig. 2

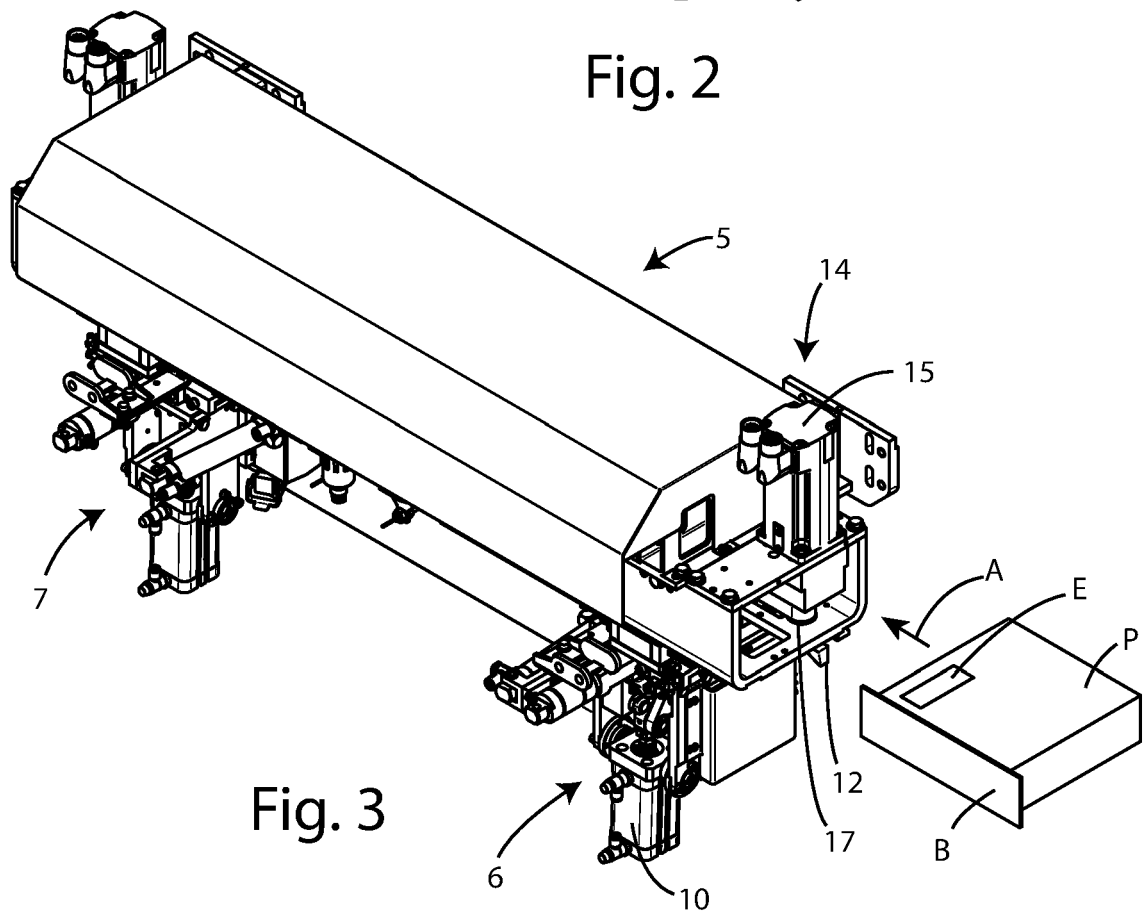
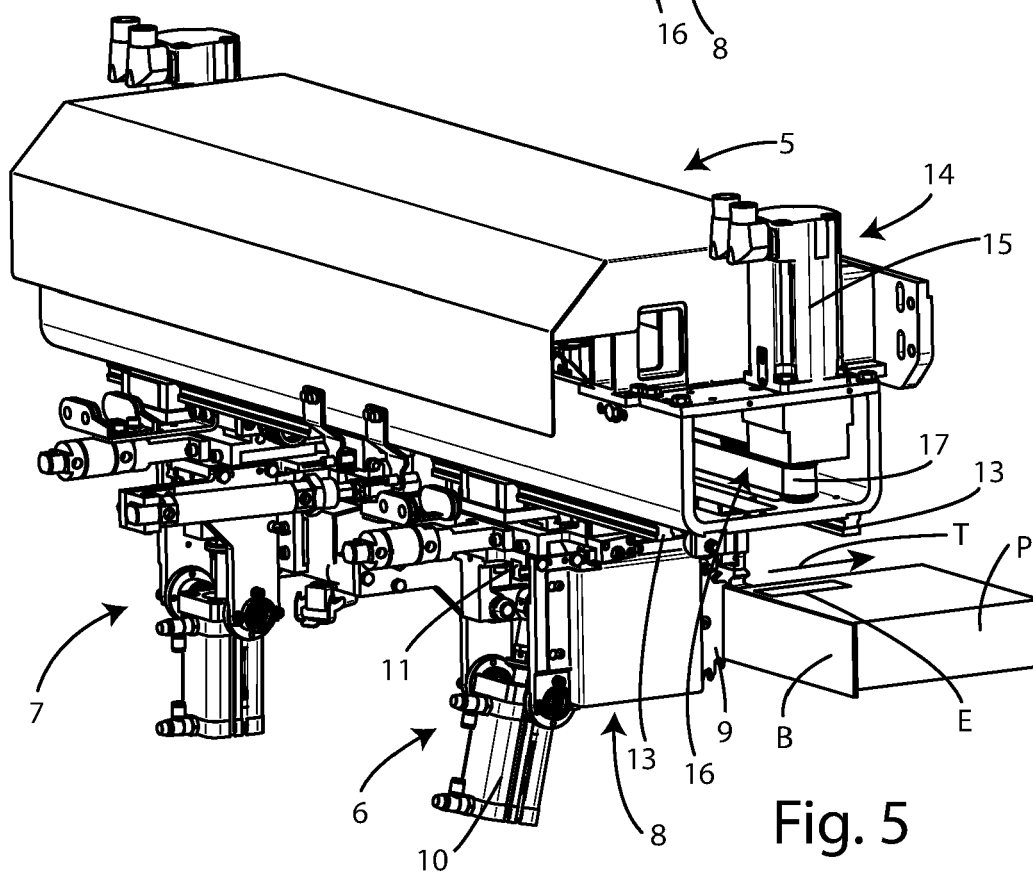
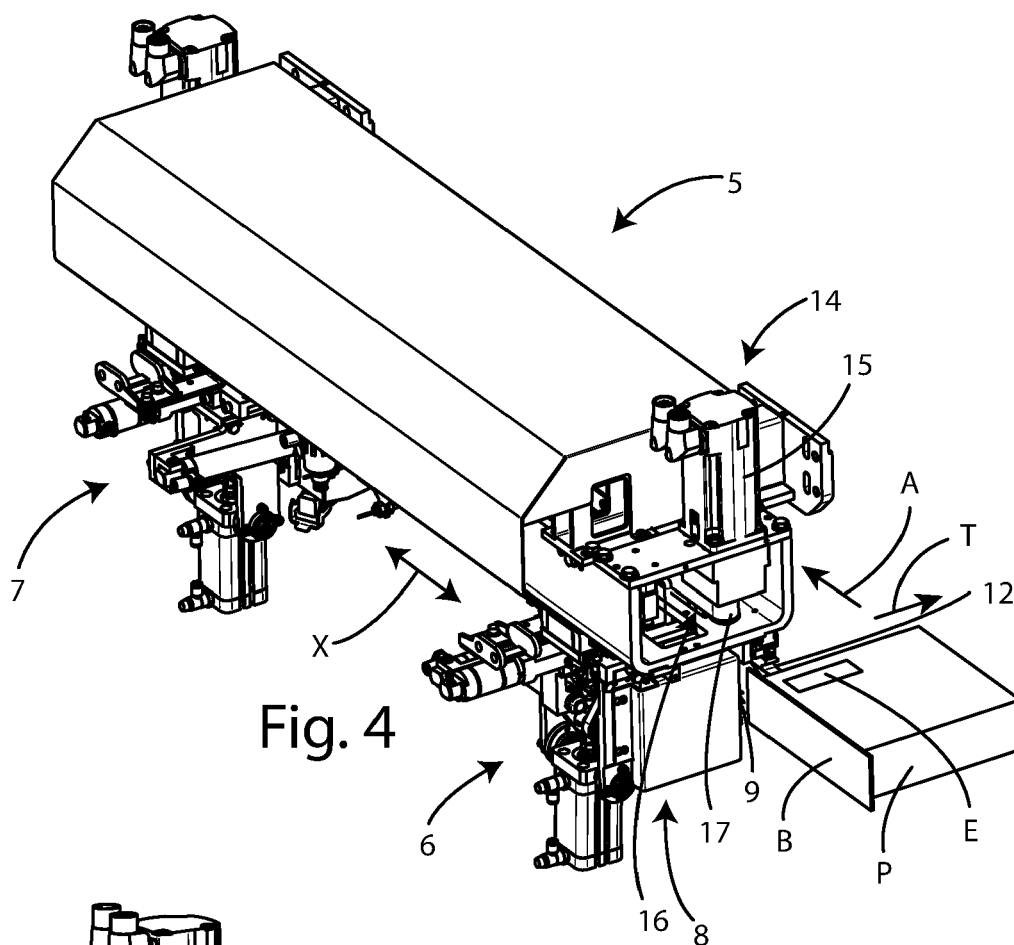


Fig. 3





EUROPEAN SEARCH REPORT

Application Number

EP 22 18 8924

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EPO FORM 1503 03.82 (P04C01)

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	DE 20 2015 008745 U1 (SCM GROUP SPA [IT]) 26 January 2016 (2016-01-26)	1-11, 13, 14	INV. B27D5/00
A	* paragraphs [0001], [0028], [0029], [0021], [0023], [0024], [0053], [0054], [0056], [0055] * * figures *	15	B27M1/08
X	IT BS20 110 171 A1 (CMS SPA) 15 June 2013 (2013-06-15)	1-7, 9, 10, 12, 13	
A	* paragraphs [0010], [0015], [0082], [0084] * * figures *	8, 11, 14, 15	
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A	* paragraphs [0002], [0004], [0016] * * claims * * figures *	8, 14	
			TECHNICAL FIELDS SEARCHED (IPC)
			B27D B27M
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 30 November 2022	Examiner Hamel, Pascal
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 18 8924

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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30-11-2022

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