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(54) SANDING MACHINE FOR MACHINING WORKPIECES COMPRISING A DEVICE FOR ADJUSTING A SANDING COMPONENT

(57) The present invention concerns a machine (M) for machining a workpiece (P) to be worked in wood, metal, composite and the like, comprising a base (B_1), for supporting said machine (M) on the ground, an entry station (1) for the entry of said workpiece (P) to be worked and an exit station (2) for the exit of the worked workpiece (P), a conveyor group (3) for transporting said workpiece (P), according to a forward direction (A), from said entry station (1) towards said exit station (2), at least one machining unit (4) of said workpiece (P), arranged elevated with respect to said conveyor group (3) comprising at least one working tool (41) of said workpiece (P), capable of moving from a lowered operating position with respect to said base (B_1), wherein it is in contact with the workpiece (P), to a raised operating position with respect to said base (B_1), wherein it is in contact with the workpiece (P), wherein the movement from one operating position to another is controlled by defects in the surface of the workpiece (P), at least one drive unit (5), coupled with said at least one machining unit (4) for actuating its operation, said machine (M) being characterized in that it comprises an adjusting device (6, 6'), arranged between said at least one working tool (41) and said at least one drive unit (5), configured for causing a movement of said drive unit (5) as a consequence of a first movement of said at least one working tool (41), when said working tool (41) takes intermediate position, between said lowered operating position and said raised operating position.

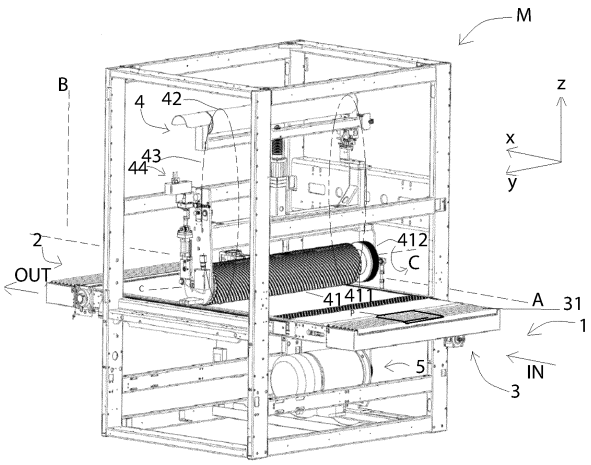

Fig. 2

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Description

[0001] The present invention concerns a sanding machine for machining workpieces made of metal, wood, or composite material, comprising a device for adjusting a sanding component, in particular the sanding roller.

Field of invention

[0002] More in detail, the invention concerns a pass-through sanding, but also satin or deburring machine, for the machining of workpieces made of metal, wood, or composite material which have a burr on their surface, comprising a device for adjusting a sanding component, in particular of the position of the sanding roller during the machining of the workpiece, but which can be used for any component for which adjustment of the position is necessary during the pass through machining of the workpiece.

[0003] In the following, the description will be directed to a sanding machine comprising a sanding roller for the machining of workpieces made of metal, wood, or composite material, but it is clear that it should not be considered limited to this specific use.

Prior art

[0004] As is well known, sanding machines are currently known for treating metal or wood, or composite material workpieces that have a burr on their surface.

[0005] By burr, it is meant a carryover or accumulation of material or a raised edge, caused by the machining of metal parts, following metalworking workings, both cold and hot, such as laser or oxy-fuel processing.

[0006] On workpieces made of any material, it happens that in the production process, a carryover of material is generated on the perimeter of the workpiece or, due to the localized temperature variation, the workpieces can deform from their natural flatness, or it is possible that following coating manufacturing processes, these undergo a variation in non-homogeneous thickness such as for example a painted bead or a variation in shape in general.

[0007] Known sanding machines include one or more conveyor belts for transporting the panels to be machined and one or more working units arranged above said conveyor belts for sanding the upper face of the workpieces.

[0008] Each working unit includes at least one lower operating roller, said driving roller, and one upper idle roller, said driven roller, connected to each other in such a way as to define a tension value of an abrasive belt mounted between the operating roller and the idle roller.

[0009] In these machines, the direction of rotation of the rollers agrees with the advancement direction of the panel being machined.

[0010] Known sanding, satin, or deburring machines eliminate burrs by working the workpiece at a fixed height, which therefore causes any irregularities on the surface of the workpiece to be flattened.

[0011] As is evident, in the case of metal pieces, this machining involves the generation of sparks, caused by the friction between the roller and the metal of the workpiece.

[0012] Machines are also known, in which the sanding components are mobile based on the variation in thickness of the workpiece being machined, in particular, based on the reading of the burr profile and the subsequent variation in the height of the machining component.

[0013] Still, machines comprising oil regulation systems to fluidize the movement of the roller based on the irregularity of the piece to be worked are known.

[0014] However, these machines include very complex adjustment mechanisms that require the detection of irregularities in the surface of the workpieces and the subsequent adjustment of the height of the operating roller.

Scope of the invention

[0015] In light of the above, it is therefore the scope of the present invention to provide a pass-through sanding machine for removing the burrs present on the surface of the workpieces in a mechanically very simple way.

[0016] Another scope of the invention is to provide a pass-through sanding machine in which the operating roller can eliminate burrs by adapting to the surface of the workpiece.

Object of the invention

[0017] It is, therefore, specific object of the present invention a machine for machining a workpiece to be worked in wood, metal, composite and the like, comprising a base, for supporting said machine on the ground, an entry station for the entry of said workpiece to be worked and an exit station for the exit of the worked workpiece, a conveyor group for transporting said workpiece, according to a forward direction, from said entry station towards said exit station, at least one machining unit of said workpiece, arranged elevated with respect to said conveyor group comprising at least one working tool of said workpiece, capable of moving from a lowered operating position with respect to said base, wherein it is in contact with the workpiece, to a raised operating position with respect to said base, wherein it is in contact with the workpiece, wherein the movement from one operating position to another is controlled by defects in the surface of the workpiece, at least one drive unit, coupled with said at least one machining unit for actuating its operation, said machine being characterized in that it comprises an adjusting device, arranged between said at least one working tool and said at least one drive unit, configured for causing a movement of said drive unit as a consequence of a first movement of said at least one working tool, when said working tool takes intermediate position, between said lowered operating position and said raised operating position.

[0018] Further according to the invention, said machine is a sanding machine, and said at least one working tool is a sanding operator roller.

[0019] Preferably according to the invention, said operator roller comprises a supporting shaft, which runs along a rotation axes, around which said operator roller is capable of rotating, said supporting shaft is provided with a first end coaxial with said rotation axis and a second end coaxial with said rotation axis, and a driven pulley is keyed on said first end, coupled in rotation to said drive unit, by means of driving belts.

[0020] Always according to the invention, said adjusting device is arranged between said first end of said supporting shaft and said drive unit.

[0021] Still according to the invention, said adjusting device is capable of configuring, in a plane section orthogonal to said rotation axis, a four-bar linkage wherein said base acts as a fixed structure, and wherein a first rod, rotatable with respect to said base around a first axis, parallel and distinct with respect to said rotation axis, is a first member that receives, rotatably around said rotation axis, said first end of said supporting shaft in its own support having a development axis, parallel to said first axis, a second rod, rotatable with respect to said base around a second axis, parallel and distinct with respect to said rotation axis and first axis, is a second member of said four-bar linkage, having a second hinge having a third axis parallel and distinct with respect to said second axis, a connecting rod that connects said first and second rods, hinged on said first and second rods, so that the movement of said third axis depends on the movement of said development axis.

[0022] Further according to the invention, said four-bar linkage is an articulated parallelogram wherein said first rod is a rocker arm having a first hinge with a first rotation axis parallel to said first axis, said second rod is a rocker arm having a second hinge having a second rotation axis parallel to said second axis, the distance between said first axis and first rotation axis is equal to the distance between said second axis and second rotation axis, said connecting rod being configured to connect said first hinge having as axis said rotation axis, and said second hinge having as axis said second rotation axis so that the plane defined by said first axis and first rotation axis is parallel to the plane defined by said second rotation axis and second axis.

[0023] Preferably according to the invention, said first rotation axis coincides with said development axis, and said second rotation axis coincides with saic third axis.

[0024] Always according to the invention, said development axis and third axis determine a plane parallel to the plane determined by said first axis and second axis.

[0025] Still according to the invention, said adjusting device comprises a third rod, capable of causing the vertical movement of said drive unit with respect to said base.

[0026] Further according to the invention, said adjusting device comprises an abutment element, said first rod comprises a first end capable of moving from a first position in which it is abutting on said abutment element and a second position, in which it is distant from said abutment element.

[0027] Preferably according to the invention, when said first end of said first rod is in said first position, said operator roller is in said lowered operating position and when said first end of said first rod is in said second position, said operator roller is in said raised operating position.

[0028] Always according to the invention, said adjusting device is arranged in correspondence with said driving belts.

[0029] Still according to the invention, said adjusting device comprises a belt tensioner roller adjustably placed in contact with said drive belts, so as to vary their tension.

[0030] Further according to the invention, the rotation direction of said operator roller around said rotation axis, is concordant, or respectively discordant, with respect to said forward direction of the workpiece, said machine may comprise a driven roller rotatable around a rotation axis, parallel to and arranged above with respect to said axis, and may comprise an abrasive belt tensioned and wrapped in a ring between said operator roller and said driven roller, said abrasive belt being drawn in rotation, and pressed against said workpiece, by said driven roller.

Brief description of the figures

[0031] 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 an axonometric view of a sanding machine for machining workpieces comprising a device for adjusting a sanding component, object of the present invention;

figure 2 shows an axonometric view of the internal part of the machine shown in figure 1;

figure 3 shows a front view of a sanding component, with the adjustment device;

figure 4 shows an axonometric view of the component shown in figure 3;

figure 5 shows a side view of the component shown in figure 3;

figure 6 shows a side view of the inside of the machine shown in figure 1;

figure 7 shows a detail view of an assembly shown in figure 6;

figure 8 shows a side view of the sanding component shown in figure 3, with the adjustment device;

figure 8' shows a conceptual diagram of the operation of the adjustment device shown in figure 8;

figure 9 shows a further side view of the sanding component shown in figure 3, with the adjustment device;

figure 10 shows a further side view of the sanding

component shown in figure 3, with the adjustment device in an operational position; and
figure 11 showsa front view of a second embodiment of the adjustment device.

Detailed description

[0032] In the various figures the similar parts will be indicated with the same numerical references.

[0033] Referring to figures 1-4, the sanding machine M object of the present invention essentially comprises a base B_1, an entry station 1, where the workpieces P to be machined are inserted according to an advancement direction A, parallel to the X axis of the Cartesian reference system XYZ, an exit station 2, from which the machined workpieces P emerge, according to the same direction A, a conveyor group 3, to transport the workpieces P to be machined according to said advancement direction A from said input station 1 towards said exit station 2, at least one machining unit 4 to carry out machining, in particular sanding, on said workpieces P to be machined, a drive unit 5 and an adjusting device 6.

[0034] The workpieces P are essentially panels made of metal, or wood, or composite material, which have undergone previous machining and on which there is a burr, i.e. a carryover or accumulation of material or a raised edge, caused by the machining of metal or composite parts, following the manufacturing processes or surface deformation.

[0035] In particular, said conveyor group 3 comprises a conveyor belt 31, on which the piece P to be machined is placed and transported from said input station 1 towards said exit station 2 according to the advancement direction A.

[0036] Said at least one machining unit 4 is arranged elevated with respect to said conveyor group 3 and extends according to a development direction B, parallel to the Z axis of the Cartesian reference system XYZ, and orthogonal to said advancement direction A.

[0037] Referring to figures 3 and 4, said at least one machining unit 4 includes at least a sanding tool 41, a driven roller 42, an abrasive belt 43, and a support frame 44, integral with a base B_1 of the machine M.

[0038] Said sanding tool 41 is arranged facing the underlying conveyor belt 31, to come into contact with the upper surface of the workpiece P, arranged above the same conveyor belt 31.

[0039] Said sanding tool 41 can be an abrasive roller, or a rotary disc, such as a pad, or a brush, or a tool with cutting elements.

[0040] In the following description, reference is made to an operating roller 41 as a sanding tool.

[0041] However, without departing from the scope of protection of the present invention, the description also applies to other types of sanding tools.

[0042] The operating roller 41 includes a support shaft 411, which develops along a rotation axis C-C, substantially parallel to the Y axis, around which it is able to rotate in a concordant or discordant manner with the aforementioned advancement direction A of the workpiece P.

[0043] Said support shaft 411 is provided with a first end 411_a and a second end 411_b, coaxial with said rotation axis C-C.

[0044] On the first end 411_a a driven pulley 412 is keyed.

[0045] Said driven pulley 412 is coupled to a drive unit 5, as will be described in detail below, by means of transmission belts 45, which determine the rotation of the operating roller 41.

[0046] On the second end 411_b a rocker arm 46 is keyed and extends radially towards the outside of the second end 411_b.

[0047] Said operating roller 41 also includes a cylindrical sleeve 49, which extends around the support shaft 411 coaxially to the C-C rotation axis, and is rotatably coupled to the support shaft 411 to rotate with respect to the support shaft 411 under the thrust of said drive unit 5, around the C-C rotation axis.

[0048] The operating roller 41 is mobile between a lowered operating position, in which the abrasive belt 43 is in contact with an upper surface of the workpiece P, and a raised operating position, in which the same operating roller 41 is lifted from the workpiece P, thus maintaining the contact of the abrasive belt 43 with the upper surface of the workpiece P.

[0049] The operating roller 41 is moved and maintained in its lowered operating position by gravity, under the pressure of its weight, and is moved from its lowered operating position to its raised operating position by an actuation device 47, which comprises a pneumatic cylinder 48 coupled to said rocker arm 46.

[0050] The linear motion of the pneumatic cylinder 48 is transformed, via said rocker arm 46, into a rotary motion of the operating roller 41 around the rotation axis C-C.

[0051] Said driven roller 42 is idle and is positioned above the operating roller 41.

[0052] Said abrasive belt 43 is wound in a ring around the aforementioned driven roller 42 and operating roller 41.

[0053] Said support frame 44 is configured to support the operating roller 41 and the driven roller 42.

[0054] The support frame 44 includes a first upright element 441 and a second upright element 442 configured to limit the translation of the abrasive belt on the operating roller 41 along the C-C rotation axis.

[0055] The support frame 44 comprises a reference crosspiece 443 positioned between said first 441 and second 442 upright elements.

[0056] The support frame 44 further comprises a transverse support member 444, positioned above the reference crossbar 443, configured to support the free rotation of the driven roller 42.

[0057] The support frame 44 further comprises a tensioning cylinder 445 of the abrasive belt 43, positioned between the reference crosspiece 443 and the transverse support element 444, to allow the tensioning of the

abrasive belt 43, to maintain the tension of the abrasive belt 43 during machine operation M.

[0058] Said drive unit 5 comprises a motor 51 and a drive pulley 52.

[0059] Said motor 51 is movable along the Z axis and, in use, rotates said drive pulley 52.

[0060] Said transmission belts 45 are wound in a ring around said driving pulley 52 and said driven pulley 412.

[0061] Said sanding machine M comprises a device 6 for regulating the height of the sanding tool 41, in particular of the operating roller.

[0062] If the sanding machine M includes several machining units 4, said adjustment device is coupled to each machining unit 4, as shown in figures 6 and 7.

[0063] Said adjustment system 6 is configured to make the operating roller 41 floating during the machining of the piece P so that it can follow the profile of the surface of the workpiece, exerting the expected working pressures on the surface itself.

[0064] In particular, said adjusting device 6 is configured to keep the tension on said transmission belts 45 constant during the machining of the workpiece P.

[0065] The adjusting device 6, based on the position assumed by the operating roller 41 during the machining of the workpiece P, adjusts the position of the said drive unit 5, in the Z direction, copying the profile of the surface of the workpiece P to be machined, consequently varying the workload, and therefore the power absorbed during machining.

[0066] The constant tensioning of the transmission belts 45 during machining is ensured by the adjusting device 6, which, depending on the movements of the operating roller 41 in the Z direction, commands corresponding movements in the Z direction of the drive unit 5.

[0067] Said adjusting device 6 allows said drive unit 5 to follow the vertical movements of said operating roller 41 while the same is floating between said lowered operating position and said raised operating position, assuming different positions, controlled by the profile of the surface of the workpiece P during machining.

[0068] In a first embodiment, said adjusting device 6 comprises an articulated system 60, which couples said operating roller 41 to said drive unit 5.

[0069] In particular, said articulated system 60 includes a four-bar linkage Q_A, which, even more specifically, is an articulated parallelogram Q_A.

[0070] Furthermore, said adjusting device 6 includes an abutment element D and an elastic element C.

[0071] In particular, referring to figures 8 and 8', said four-bar linkage Q_A comprises three rods hinged together two by two, a first rod 61, a connecting rod 62, a second rod 63. In said four-bar linkage Q_A said base B_1 serves as a fixed structure.

[0072] A third rod 64 is included in the articulated system 60 and connects said second rod 63 to said drive unit 5.

[0073] A first end 611 of said first rod 61 is free to move between a first position, in which it abuts on said abutment element D, and a second position, in which it is distant from said abutment element D.

[0074] Referring again to figures 8 and 8', said adjusting device 6 is able to configure, in a flat section, normal to said rotation axis C-C, a four-bar linkage Q_A, in which said base B_1 serves as a fixed structure.

[0075] In said four-bar linkage Q_A, a first rod 61 is rotatable with respect to said base B_1 around a first axis U, parallel and distinct from said rotation axis C-C, and is a first member, which houses, rotatably around said C-C rotation axis, said first end 411_a of said support shaft 411 in its own support having a development axis W, parallel to said first axis U.

[0076] In said four-bar linkage Q_A, a second rod 63, rotatable with respect to said base B_1 around a second axis U', parallel and distinct with respect to said rotation axis C-C and first axis U, is a second member, presenting a second hinge having a third axis W' parallel and distinct with respect to said second axis U'.

[0077] In said four-bar linkage Q_A, a connecting rod 62 is capable of connecting said first 61 and second 63 rods, and is hinged on said first 61 and second 63 rods and the movement of said third axis W' depends on the movement of said development axis W.

[0078] In particular, said four-bar linkage Q_A is an articulated parallelogram, in which said first rod 61 is a rocker arm having a first hinge with a first rotation axis V parallel to said first axis U, said second rod 63 is a rocker having a second hinge having a second rotation axis V' parallel to said second axis U', wherein the distance between said first axis U and first rotation axis V equals the distance between said second axis U' and second rotation axis V'.

[0079] Said connecting rod 62 is configured to connect said first hinge, having as its axis said first rotation axis V, and said second hinge having as its axis said second rotation axis V' so that the plane defined by said first axis U and first rotation axis V is parallel to the plane defined by said second rotation axis V' and second axis U' .

[0080] In a variant of the present embodiment, said first rotation axis V coincides with said development axis W, and said second rotation axis V' coincides with said third axis W'.

[0081] Said development axis W and third axis W' define a plane parallel to the plane defined by said first axis U and second axis U'.

[0082] Said adjusting device 6 also comprises a third rod 64, capable of causing the vertical displacement of said drive unit 5 with respect to said base B_1.

[0083] Said elastic element C is coupled to said motor 51 and is capable of performing pre-load compensation. This adjustment is made necessary to guarantee uniformity of behavior when the masses associated with said third rod 64 vary, compensating for the construction variables of the components present in said sanding machine M.

[0084] Referring now to figure 11, in a second embodiment, said adjusting device 6' comprises a belt tension-

ing roller or idler 60', which is arranged between said operating roller 41 and said driving unit 5.

[0085] Said idler 60' is coupled to said support shaft 411 of said operating roller 41 and is capable of regulating the tension on said transmission belts 45. Said idler 60' varies its position depending on the position of said operating roller 41. Through the horizontal movement of the idler 60', the tension of the transmission belt 45 on said operating roller 41 is kept constant during its vertical movement.

[0086] The operation of the M machine for processing wooden workpieces, in both embodiments, is as follows.

[0087] When it is necessary to sand a workpiece P, said workpiece P is inserted into said input station 1.

[0088] Said workpiece P is transported by said conveyor belt 31, according to the advancement direction A, inside the machine, and passes under said machining unit 4, where it undergoes a first sanding operation by the sanding tool 41, in particular of said operating roller.

[0089] Relative to the first embodiment, initially, said first end 611 of said first rod 61 is in said first position, i. e. abutting on said abutment element D, and said operating roller 41 is in said lowered operating position waiting for the workpiece P.

[0090] When the workpiece P passes along the advancement direction A, said operating roller 41 rotates around said C-C rotation axis, in a concordant or discordant direction with respect to the advancement direction of the workpiece P.

[0091] Said first end 611 of said first rod 61 passes into said second position, lifting said connecting rod 62, which in turn raises said second rod 63, which in turn raises said third rod 64, which also causes the lifting along the Z axis of the motor 51.

[0092] Lifting the motor 51 allows maintaining a constant tension on said transmission belts 45, so that the operating roller 41 can machine the workpiece P with a constant pressure, while instead varying its position along the Z axis.

[0093] In the second embodiment, the operation of the adjusting device 6' is such that said idler 60' exerts a force on the transmission belts 45, which is a function of the distance between the centers between said operating roller 41 and said motor 51, thus leaving the height of the motor 51 remains unchanged. Said idler 60' varies its position according to the position of said operating roller 41. Through the horizontal movement of the idler 60', the tension of the transmission belt 45 on said operating roller 41 is kept constant during its vertical displacement.

Advantages

[0094] As is evident from the above description, the sanding machine comprising the adjustment device of the sanding component allows the sanding or satin finishing of the workpieces on whose surface there are burrs or irregularities of dimensions different from the nominal one, and maintaining the working pressure of the operating roller, and therefore without overheating the workpiece being machined.

[0095] 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 (M) for machining a workpiece (P) to be worked in wood, metal, composite and the like, comprising:

   a base (B_1), for supporting said machine (M) on the ground;
   an entry station (1) for the entry of said workpiece (P) to be worked and an exit station (2) for the exit of the worked workpiece (P);
   a conveyor group (3) for transporting said workpiece (P), according to a forward direction (A), from said entry station (1) towards said exit station (2) ;
   at least one machining unit (4) of said workpiece (P), arranged elevated with respect to said conveyor group (3) comprising at least one working tool (41) of said workpiece (P), capable of moving from a lowered operating position with respect to said base (B_1), wherein it is in contact with the workpiece (P), to a raised operating position with respect to said base (B_1), wherein it is in contact with the workpiece (P), wherein the movement from one operating position to another is controlled by defects in the surface of the workpiece (P),
   at least one drive unit (5), coupled with said at least one machining unit (4) for actuating its operation,
   said machine (M) being **characterized in that** it comprises an adjusting device (6, 6'), arranged between said at least one working tool (41) and said at least one drive unit (5), configured for causing a movement of said drive unit (5) as a consequence of a first movement of said at least one working tool (41), when said working tool (41) takes intermediate position, between said lowered operating position and said raised operating position.

2. Machine (M) according to the preceding claim, **characterized**

   in that it is a sanding machine; and
   in that said at least one working tool (41) is a sanding operator roller.

3. Machine (M) according to the preceding claim, **characterized**

in that said operator roller (41) comprises a supporting shaft (411), which runs along a rotation axes (C-C), around which said operator roller (41) is capable of rotating,
in that said supporting shaft (411) is provided with a first end (411_a) coaxial with said rotation axis (C-C) and a second end (411_b) coaxial with said rotation axis (C-C), and
in that a driven pulley is keyed (412) on said first end (411_a), coupled in rotation to said drive unit (5), by means of driving belts (45).

4. Machine (M) according to the preceding claim, **characterized in that** said adjusting device (6, 6') is arranged between said first end (411_a) of said supporting shaft (411) and said drive unit (5).

5. Machine (M) according to the preceding claim, **characterized in that** said adjusting device (6) is capable of configuring, in a plane section orthogonal to said rotation axis (C-C), a four-bar linkage (Q_A) wherein said base (B_1) acts as a fixed structure, and wherein:

- a first rod (61), rotatable with respect to said base (B_1) around a first axis (U), parallel and distinct with respect to said rotation axis (C-C), is a first member that receives, rotatably around said rotation axis (C-C), said first end (411_a) of said supporting shaft (411) in its own support having a development axis (W), parallel to said first axis (U);
- a second rod (63), rotatable with respect to said base (B_1) around a second axis (U'), parallel and distinct with respect to said rotation axis (C-C) and first axis (U), is a second member of said four-bar linkage (Q_A), having a second hinge having a third axis (W') parallel and distinct with respect to said second axis (U');
- a connecting rod (62) that connects said first (61) and second (63) rods, hinged on said first (61) and second (63) rods so that the movement of said third axis (W') depends on the movement of said development axis (W) .

6. Machine (M) according to claim 5, **characterized in that** said four-bar linkage (Q_A) is an articulated parallelogram wherein:

- said first rod (61) is a rocker arm having a first hinge with a first rotation axis (V) parallel to said first axis (U);
- said second rod (63) is a rocker arm having a second hinge having a second rotation axis (V') parallel to said second axis (U');
- the distance between said first axis (U) and first rotation axis (V) is equal to the distance between said second axis (U') and second rotation axis (V');
- said connecting rod (62) being configured to connect said first hinge having as axis said rotation axis (V), and said second hinge having as axis said second rotation axis (V') so that the plane defined by said first axis (U) and first rotation axis (V) is parallel to the plane defined by said second rotation axis (V') and second axis (U').

7. Machine (M) according to the preceding claim, **characterized**

in that said first rotation axis (V) coincides with said development axis (W), and
in that said second rotation axis (V') coincides with said third axis (W').

8. Machine (M) according to claim 5, **characterized in that** said development axis (W) and third axis (W') determine a plane parallel to the plane determined by said first axis (U) and second axis (U').

9. Machine (M) according to any one of claims 5-8, **characterized in that** said adjusting device (6) comprises a third rod (64), capable of causing the vertical movement of said drive unit (5) with respect to said base (B_1) .

10. Machine (M) according to any one of the preceding claims, **characterized**

in that said adjusting device (6)
comprises an abutment element (D),
in that said first rod (61) comprises a first end (611) capable of moving from a first position in which it is abutting on said abutment element (D) and a second position in which it is distant from said abutment element (D).

11. Machine (M) according the preceding claim, **characterized in that**, when said first end (611) of said first rod (61) is in said first position, said operator roller (41) is in said lowered operating position and when said first end (611) of said first rod (61) is in said second position, said operator roller (41) is in said raised operating position.

12. Machine (M) according to any one of claims 3 or 4, **characterized in that** said adjusting device (6') is arranged in correspondence of said driving belts (45).

13. Machine (M) according to the preceding claim, **characterized in that** said adjusting device (6') comprises a belt tensioner roller (60') adjustably placed in

contact with said drive belts (45), so as to vary their tension.

14. Machine (M) according to any one of the preceding claims, **characterized**

in that the rotation direction of said operator roller (41) around said rotation axis (C-C), is concordant, or respectively discordant, with respect to said forward direction (A) of the workpiece (P),
in that it comprises a driven roller (42) rotatable around a rotation axis (C'-C'), parallel to and arranged above with respect to said axis (C-C), and
in that it comprises an abrasive belt (43) tensioned and wrapped in a ring between said operator roller (41) and said driven roller (42), said abrasive belt (43) being drawn in rotation, and pressed against said workpiece (P), by said driven roller (41).

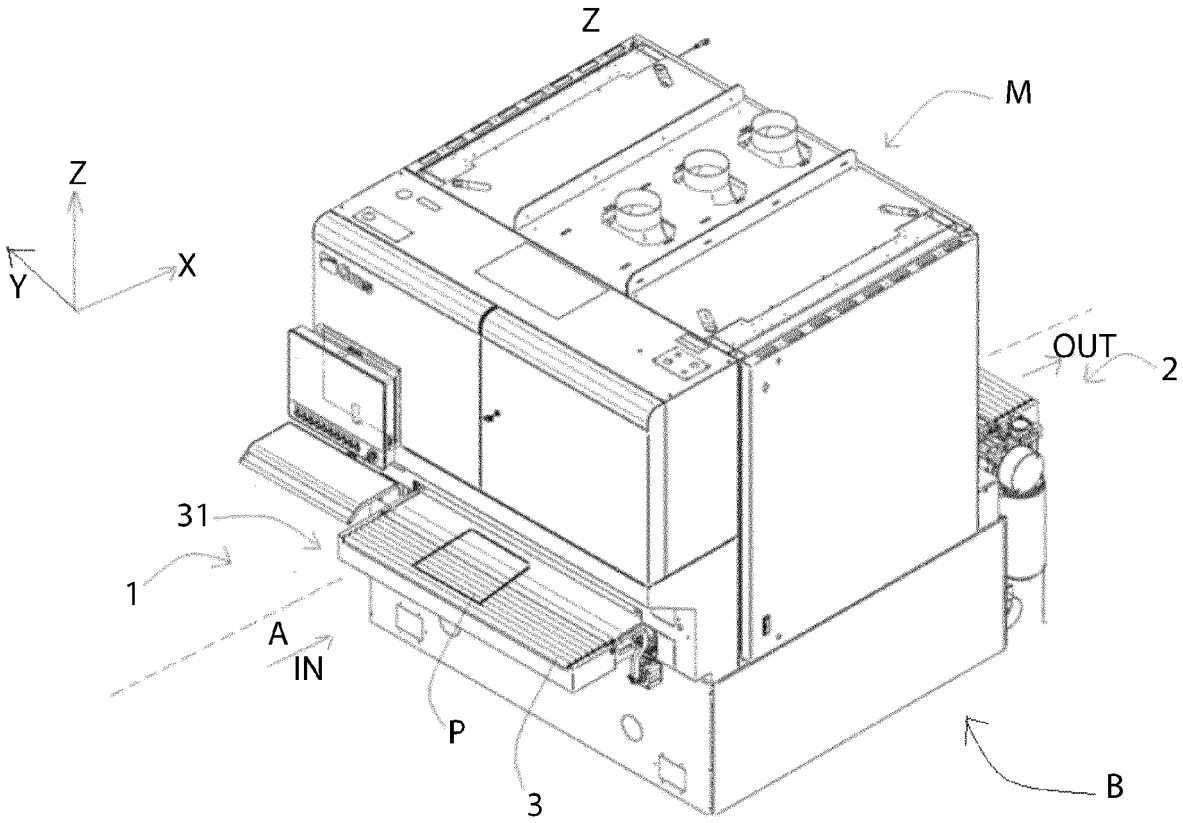

Z
M
Z
Y
X
OUT
2
31
1
A
IN
P
3
B

Fig. 1

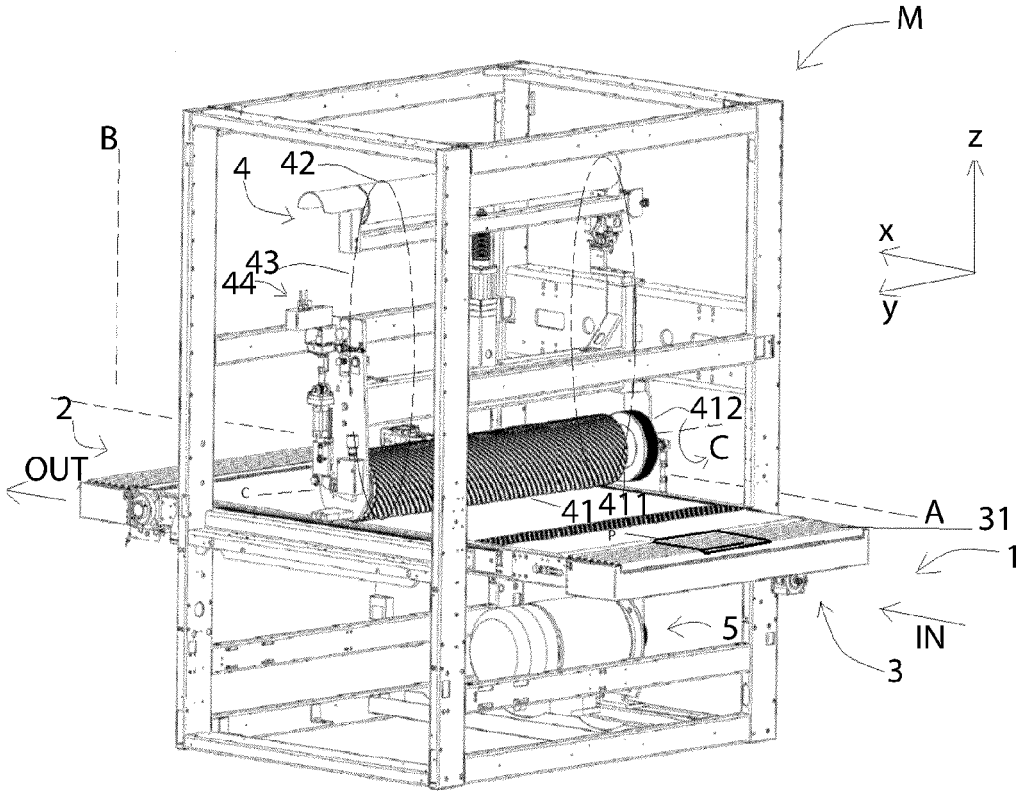

M
B
4
42
43
44
z
x
y
2
OUT
412
C
41
411
A
31
1
5
IN
3

Fig. 2

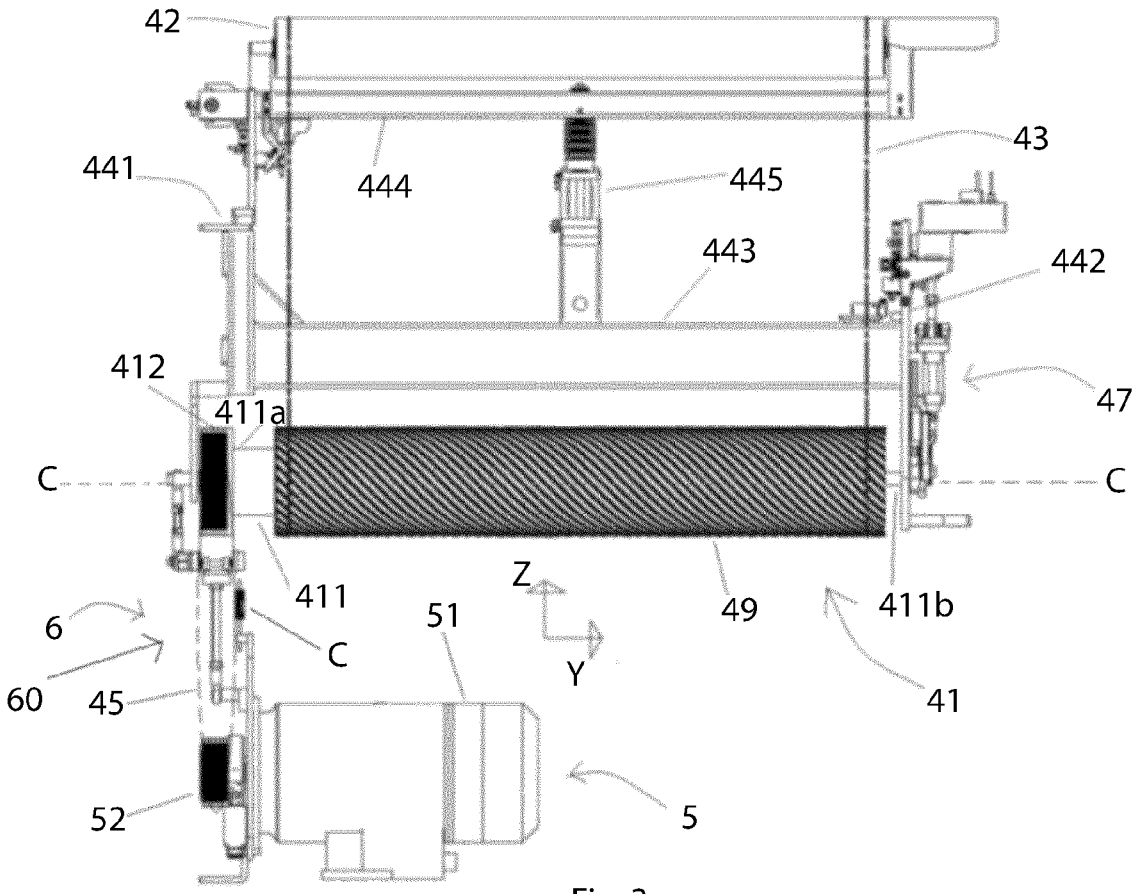
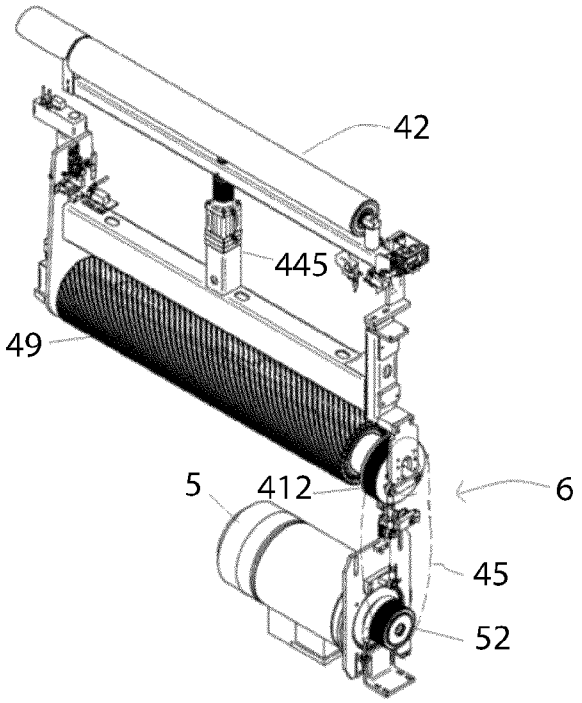

42
441
444
445
43
443
442
412
411a
47
C
C
411
Z
49
411b
6
51
C
Y
60
45
41
52
5

Fig. 3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445
49
5
412
6
45
52

Fig. 4

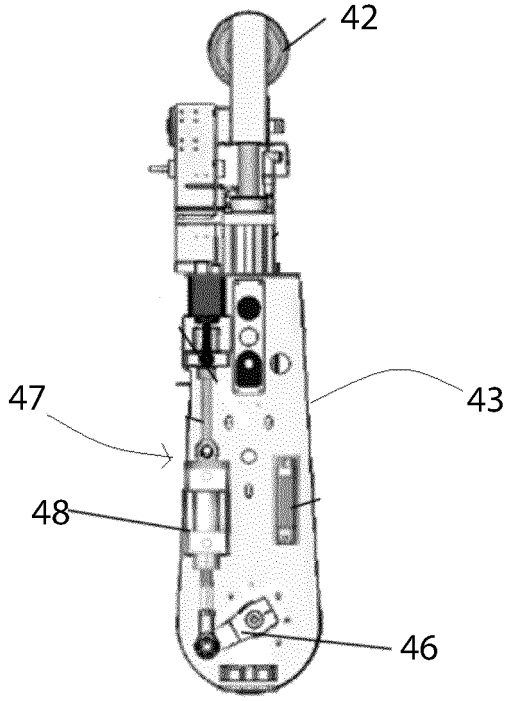

Fig. 5

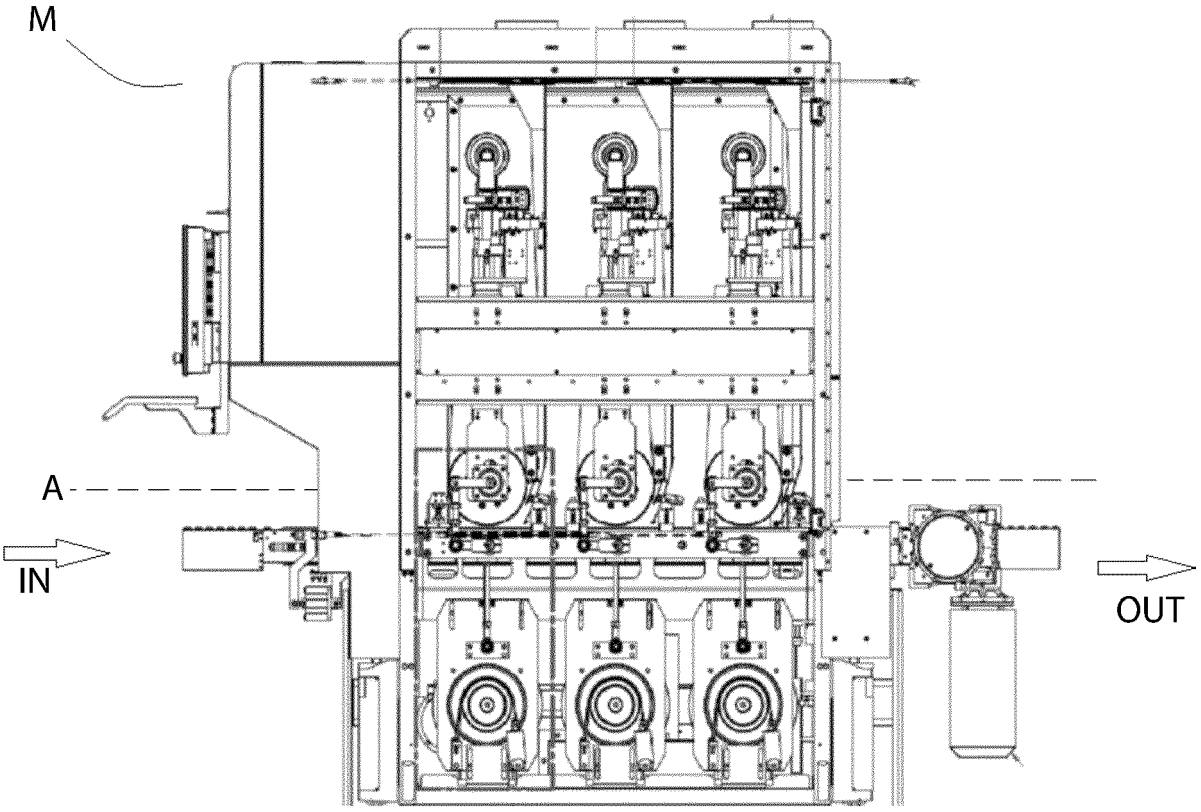

Fig. 6

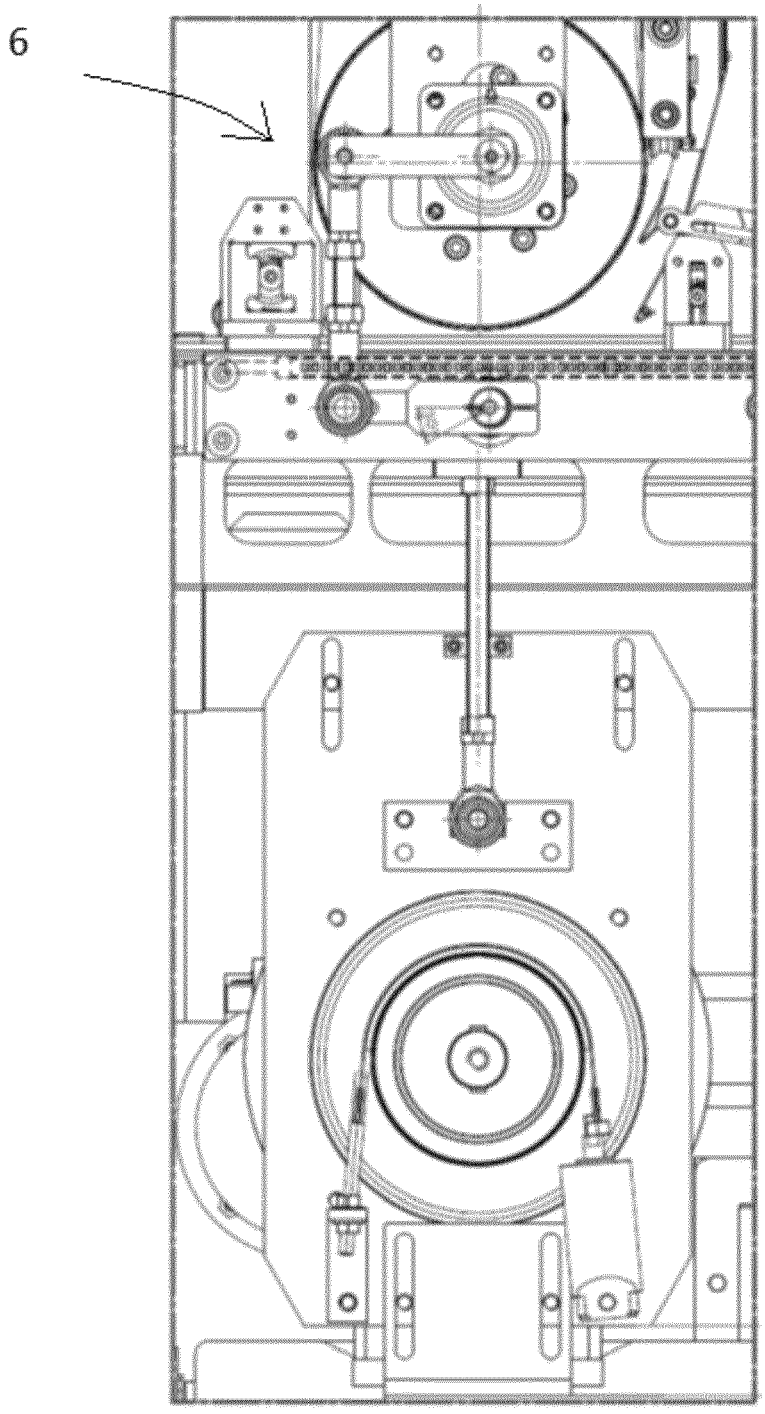

Fig. 7

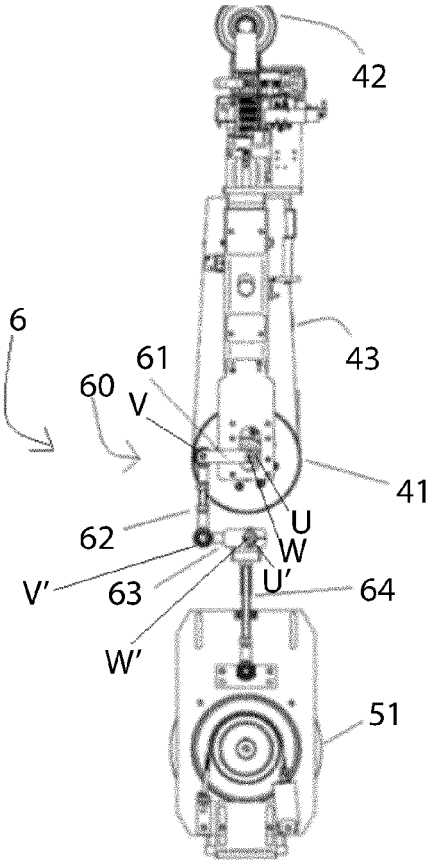

Fig. 8

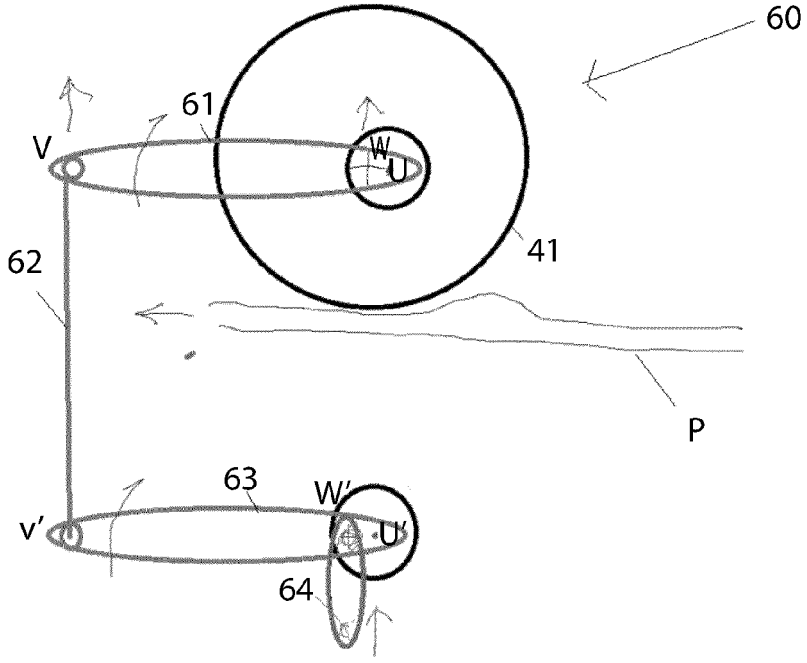

Fig. 8'

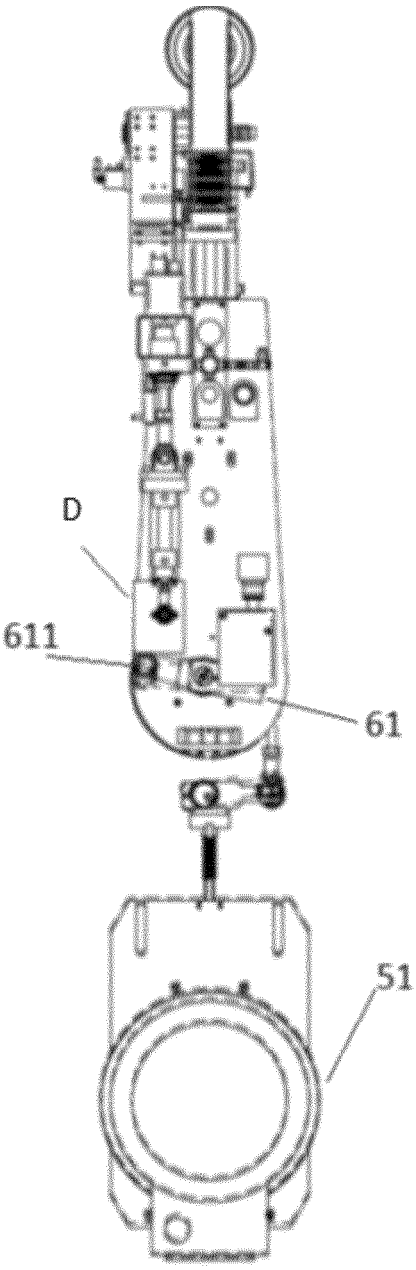

Fig. 9

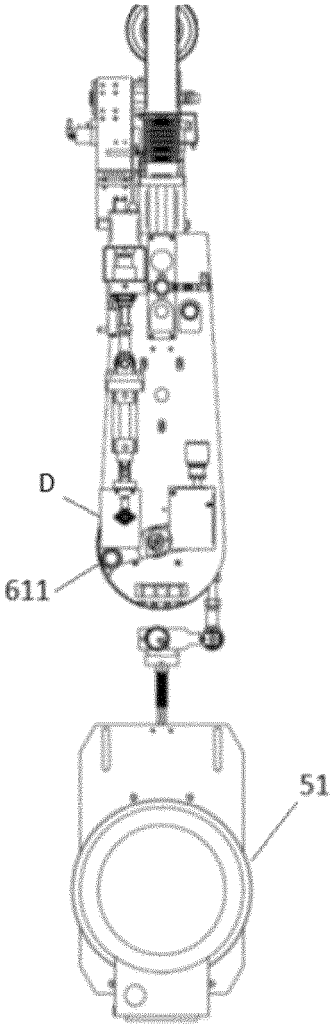

Fig. 10

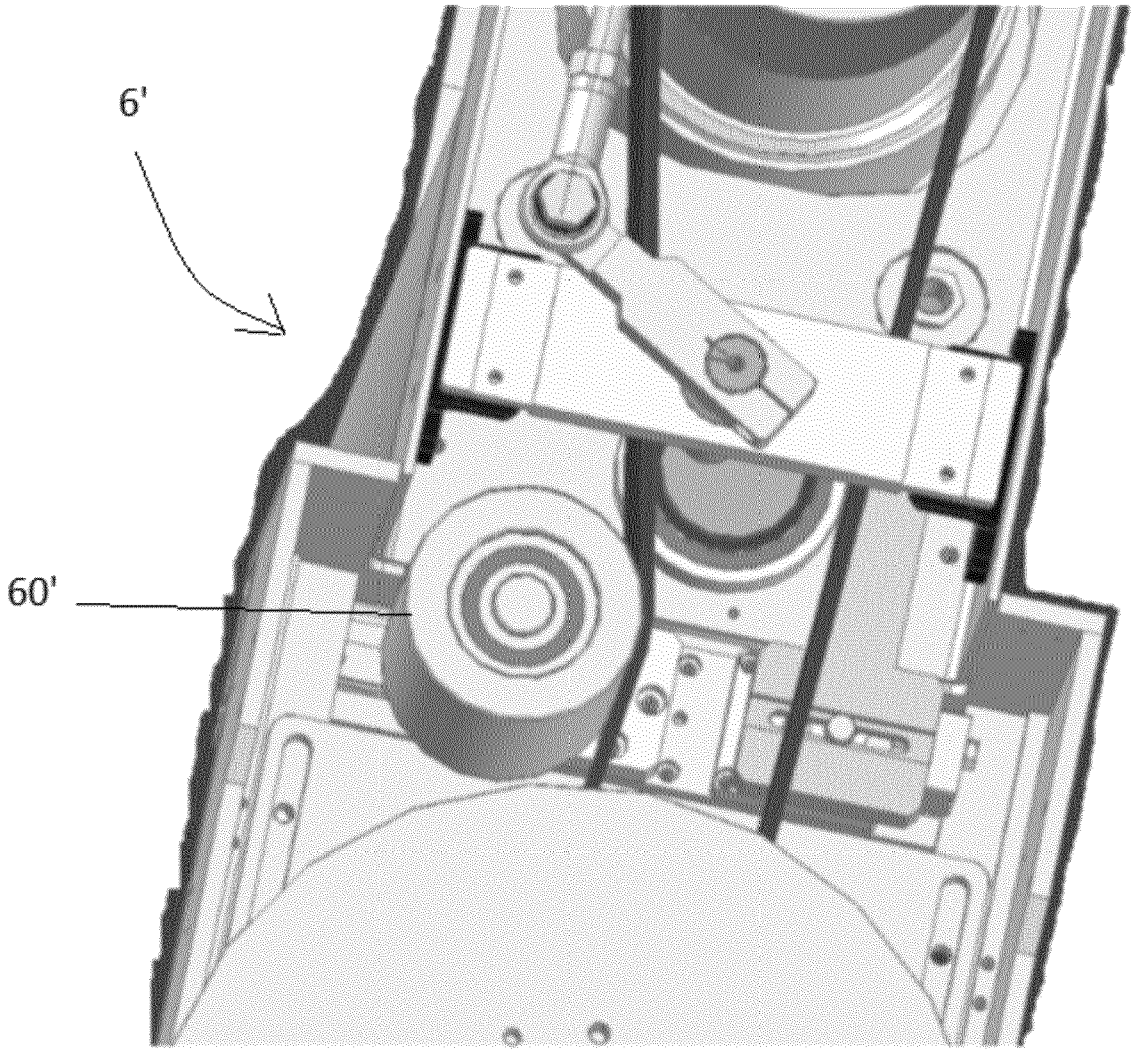

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 23 20 3145

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	GB 1 159 167 A (METABOWERKE KG CLOSE RAUCH & S [DE]) 23 July 1969 (1969-07-23)	1	INV.
			B24B7/00
Y	* figure 1 *	2-14	B24B7/06
	* page 1, line 78 - page 2, line 2 *		B24B47/20
	* page 2, line 62 - page 3, line 104 *		B24B21/12
	* claims 1-7 *		

Y	US 3 374 583 A (JACOBI ARNO M) 26 March 1968 (1968-03-26)	1-14	
	* figures 1-4 *		
	* column 4, lines 40-56 *		

Y	US 2008/207096 A1 (CHANG WEN-CHI [TW]) 28 August 2008 (2008-08-28)	1-14	
	* paragraphs [0031], [0036] *		
	* figures 1, 2 *		
	* claim 11 *		

TECHNICAL FIELDS SEARCHED (IPC)
B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 January 2024	Herrero Ramos, J

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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25-01-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82