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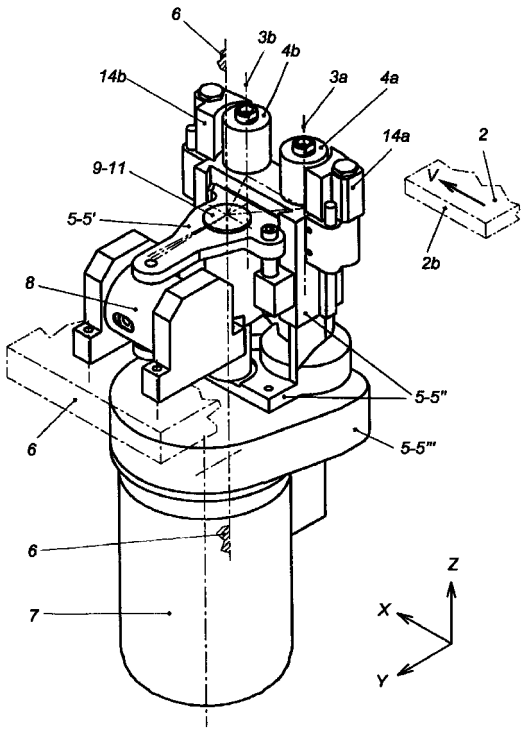
(54) Working unit for edging wooden panels

(57) An operative set for the milling of wooden panels comprises two shafts (3a,3b) actuated by motors (7) with related tools (4a,4b), elements (5) able to move relative to the machine bed (6) by means of actuators (8) to support the two shafts in parallel, wherein the moving element (5) is the same for the two shafts (3a,3b) and is articulated to the bed (6) with a pivot (11) parallel to the shafts, so that an alternating contact of the two tools (4a,4b) on the edge (2b) of the panels can occur. A single electric motor (7) can be provided for the two shafts actuated by means of a belt (10), and an articulated quadrilateral (13) can replace the pivot (11). Tracing elements (14a,14b) can be associated to the tools (4a,4b) to trace the edge.

FIG.1



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Description

[0001] The present invention relates to an operative set comprising multiple, normally parallel tool-holder shafts, destined to be applied onto known beading machines for panels for working wood and the like, preferably single-sided beading machines, and destined to execute milling operations for grinding the edges of said panels. The grinding operation on the edge of the panel by planing is often necessary when the panel comes directly from the sectioning machine, which notoriously generates panels with edge defects, so that a grinding operation is required before the beading, which must be executed with two counter-rotating shafts, first the one rotating in a direction opposite that of advancement to execute nearly the entire work operation more correctly, then the one rotating in the direction of advancement to execute a short final segment, in order to avoid the known phenomenon of the chipping of the counter-rotating tool at the trailing edge, at the rear of the panel.

[0002] The invention more specifically relates to a set of this kind provided with a pair of tool-holder shafts, with elements assembled together, to constitute moving elements of members with integral motion, where said elements support said shafts in a parallel manner, set provided with articulation means in the manner of kinematic chains interposed between said moving elements and a machine bed, and also provided with actuators to orient or actuate the moving elements relative to the bed and allow the tools to grip onto the pieces, and lastly provided with electrical motorisation means for said tool-holder shafts.

[0003] In the prior art of the industry, such milling operative sets are known, able to be installed at the leading edge on beading machines for working wooden panels, sets which are also produced by the Applicant and whose set-up requires two milling electrical spindles, i.e. shaft sets with related end tool and coaxial motor, with parallel axes, mounted on respective slides set side by side, independent and equal, which by translation bring the tool of each electrical spindle in contact with the edge of the piece to be ground. With reference to three orthogonal directions X, Y, Z where X is the direction of advance of the panels with translation speed V, Z is the direction of the axes of the shafts and XZ is the plane of lay of said edges to be ground, in the aforementioned configurations constituting the state of the art, said independent slides translate along Y and engage, or disengage, the rotating tools in a direct or reverse direction in the edge of the panels at appropriate instants, to avoid chipping as is well known.

[0004] The aforementioned known solution of the set in which two electrical spindles are present, and hence two motors with related shafts and tools, presents first of all an economic drawback, in that the presence of a motorisation for each shaft equates to having to install twice the power required for cutting, and not only in terms of motors but also in terms of controls for said motors, such as frequency inverters, which must necessarily be duplicated when the motors have overlapping phases in the operating cycle.

[0005] Another drawback presented by the solution described above is the fact that the size of the motor conditions the diameter of the tool, which in turn conditions the length of the beading machine. The size, and hence the diameter of the motor, is a datum of the problem that depends solely on the power required for cutting, and the coaxial disposition between motor and tool, characteristic of electrical spindles, imposes a tool diameter that exceeds motor diameter in order to reach the edge of the pieces that is to be milled; if one considers the reduced confluence angle (about 10 degrees) between the track for the introduction of the material and the edge of the transiting panel, and one requires - as is mandatory in these machines - the grinding set to be contained in said confluence angle, one can immediately see that the large diameters of the tool cause the grinding set to be positioned more to the rear of the machine, whilst smaller tool diameters allow a more forward positioning, and thus allow to construct smaller machines.

[0006] Equally, in regard to the aforementioned sets with electrical spindles with parallel axes actuated by adjacent and independent slides, one should recall the drawback they present, i.e. the creation of undesired notches on the edge to be ground, if the motion of a slide occurs when the tool of the other slide is in contact, due to the peaks of the inertia forces on the structures, caused by the accelerations of the sets.

[0007] The aim of the operative grinding set of the present invention is to eliminate the aforementioned drawbacks. The invention, as it is characterised by the claims, thus solves both the problem of obtaining an operative grinding milling set with two parallel shafts, not coaxial with the motor, with which the grinding operation can be executed on the edge mounting tools with sufficiently reduced diameter, also avoiding the undesired generation of notches due to the motion of a shaft whilst the other one is in contact, and which does not require an excessive machine length to be correctly installed within said confluence angle of the panel with the edge.

[0008] The idea developed hereafter achieves the aforesaid aims with a configuration of the operative set of the type mentioned which generally comprises a pair of shafts for supporting related end tools, means configuring moving elements of members moving integrally relative to a machine bed and supporting said shafts parallel to each other, means constituting kinematic chains between said bed and each moving element, actuators for activating said kinematic chains and hence for positioning the moving elements, such as to cause the engagement and disengagement of the tools from the milling of the edges of the panels, and lastly electrical motors supported by said moving elements for actuating said shafts, where in the specific case of the set of

the invention the disposition is such that the two said tool-holder shafts are both supported by a single common moving element, and in that said means in the manner of kinematic chain consist of a pivot whose axis of rotation is substantially parallel to that of said shafts and on which said common moving element is articulated on said bed, so that with an angular movement of said common moving element a first tool is engaged in the milling of said edge, the second tool being disengaged, whilst with an angular movement of said common moving element, substantially in the opposite direction to the previous movement, the second tool is engaged in the milling of the same said edge, the first tool being disengaged, thereby allowing for an alternating milling with the two said tools.

[0009] Further specifications, additions and variations to the above description are also envisioned, such as a single motor for both shafts, a belt drive between the single motor and the two shafts, the kinematic chain for the moving element being constituted by a planar articulated quadrilateral instead of the aforementioned pivot, the presence of edge tracers or copiers.

[0010] The use of such a configuration allows to obtain the result that with small movements of the triangle identified by the axes of the two shafts and by the axis of the pivot, the first tool or, by mutual exclusion, the second tool, can come in contact, thereby avoiding any problem of mutual interference and thus also of defects on the pieces.

[0011] The advantages obtained by means of the present invention derive from multiple circumstances. In the first place, the fact that the motor is not coaxial to the shafts allows to use tools with reduced diameter, so that the set can be positioned rather forward in the sector of the confluence angle between the belt or strip to be beaded and the edge of the panel, enabling the construction of a shorter, and hence more economical, machine. In the second place, the single motor that actuates both shafts by means of the drive belt also represents a factor for the economic construction of the machine, for compactness and for simplicity. This solution even allows, with appropriate ratios between the pulley of the motor and that of the tool-holder shafts, to obtain the speed needed by the tools on the shafts, using common three-phase asynchronous motors operating with mains frequency and consequently eliminating the need to install inverters.

[0012] As stated, lastly, further advantages are given both by the fact that the tools come in contact in mutually exclusive fashion and hence no defects are thereby produced on the piece, and by the fact that strokes are extremely short and the exclusion position is extremely easy to obtain as an intermediate position between the two engagement positions of the two tools.

[0013] The invention is described in greater detail hereafter, with the aid of the drawings that show an embodiment provided purely by way of non constraining example. For instance, with reference to three mutually orthogonal directions X, Y, Z, and where X is the direction of advancement of the pieces, Z is the direction of the axes of the shafts, and XZ is plane of lay of the edge 2b undergoing work:

- Figure 1 shows an axonometric view of the grinding set as a whole, where all elements are assembled together, and in particular one can see the moving element 5 composing the integral members 5' (rotation control bracket), 5'' (shaft support) and 5''' (base plate);
- Figure 2 shows an axonometric view of the details 5' and 5'' (where 5'' clearly shows the seats of the shafts 3a and 3b), shown separated from the set and also mutually disassembled;
- Figure 3 shows an axonometric view of the grinding set with some pieces removed, the better to illustrated the disposition of the shafts relative to the motor and the belt drive;
- Figure 4 shows a view according to the direction Z where, on the edge 2b of the piece 2, the tool 4a, counter-rotating relative to the direction of advance, is engaged;
- Figure 5 shows a view according to the direction Z where, on the edge 2b of the piece 2, the tool 4b, rotating in the direction of advance, is engaged.

[0014] This grinding milling operative set, innovative in its overall architecture, essentially comprises a moving element 5 articulated to the bed 6 of the machine through a rotary couple in the form of a pivot 11. The moving element 5 is composed, in the present embodiment, of a set of mutually, though adjustably, integral members, such members substantially comprising a bracket 5' for commanding the rotation of the element 5, a support 5'' for the shafts 3a and 3b, with which the bracket 5' is adjustably integral through linear guides, and a base plate 5''' that sustains the support 5'' and whereto the sole electric motor 7 of the set is inferiorly flanged. The base plate 5''' also houses the belt drive system 10, winding on the pulleys 12 both of the motor 7 and of the shafts 3a and 3b, a suitable ratio existing between the diameters of said pulleys. In a section with a plane XY normal to the axes of the shafts, the trace of the axis of the pivot 11 identifies the vertex of an isosceles triangle whose other two vertices are the traces of the axes of the shafts 3a and 3b. The trace of the axis of the motor 7 is, in this planar section, on the straight line of the height relating to the base of said isosceles triangle, at the opposite side of the base relative to the vertex. The plane defined by the axes of the two shafts 3a and 3b is substantially parallel, in the exclusion position of the set, to the plane of the edge 2b undergoing work, and the panels 2 transiting with velocity V along the direction X are at the opposite side of the motor 7 relative to said plane. The tools 4a and 4b are mills and are located respectively at the ends of the shafts 3a and 3b; to the side of said tools 4a and 4b are

two respective edge tracers or copiers 14a and 14b. A double-action cylinder 8 is provided, fastened to the bed 6, for actuating the moving element 5, acting on the bracket 5'.

[0015] Functionally, when a piece 2 approaches, with velocity V along X, the operative milling grinding set 1, the piston 8 imparts a force F1 which tends to bring the tool 3a in contact with the edge 2b of the piece 2. The tracer 14a will be adjusted flush with the counter-rotating tool 4a, by a quantity equal to the required removal; during the milling operation, under the constant action of the force F1, the set 1 will be angled, in a plane XY, by an angle "a" relative to the direction Y, i.e. "a" will be the angle between said height of the isosceles triangle and the direction Y.

[0016] Before the counter-rotating tool 4a exits the tail of the panel 2, which as is well known would cause its undesired trailing edge chipping, the counter-rotating tool 4a is disengaged and the tool 4b, rotating in the direction of advancement, is engaged. For this purpose the piston 8 reverses the force, now imparting a force F2 in the opposite direction relative to F1: the set 1 then rotates globally until settling on an inclination "b" relative to the direction Y, of opposite sign with respect to "a", such that the tracer 14b - now adjusted flush with the tool 4b - touches the edge previously ground by the tool 3a, and in this condition the panel leaves the set 1, perfectly ground and with no trailing edge chipping.

[0017] The operator set 1 thus structured thus achieves its aims thanks to the mutual dispositions shown for the different elements, without having to alter the remaining structure of the existing beading machine.

[0018] The invention thus conceived can be subject to numerous modifications and variations, without thereby departing from the scope of the inventive concept. Moreover, all components can be replaced by technically equivalent elements.

Claims

1. An operative set (1) for the milling grinding of edges (2b) of panels (2) on machines for working wood or the like, preferably on continuous-traversing beading machines, set comprising:

   - a pair of shafts (3a) and (3b), for supporting related end tools (4a) and (4b);
   - means, configuring subsets or elements (5) of members (5', 5'', 5''',...) substantially integral, said elements (5) being movable relative to a machine bed (6) and supporting, rotatorily relative to their own axis, said shafts (3a) and (3b) positioned mutually parallel;
   - means (9) constituting respective kinematic chains, interposed between said bed (6) and each said moving element (5);
   - actuators (8) for the activation of said kinematic chains and the consequent positioning of each of said moving elements (5) relative to said machine bed (6), acting substantially between it and said moving elements (5), and destined to cause their movements (m) for the engagement or disengagement of said tools (4a) or (4b) in the milling of said edges (2b) of said panels (2);
   - rotating electric motors (7), supported by said moving elements (5), for actuating the rotation of said shafts (3a) and (3b), characterised in that said two tool holding shafts (3a) and (3b) are both supported by a single said moving element (5), common therefor, and in that said means (9) in the manner of kinematic chains consist of a rotatory couple (11) in the form of a pivot whose axis of rotation is substantially parallel to that of said shafts (3a) and (3b), whereon said common moving element (5) is articulated onto said bed (6), so that with an angular movement (m1) of said common moving element (5) said tool (4a) is engaged in the milling of said edge (2b), the tool (4b) being disengaged, whilst with an angular movement (m2) of said common moving element (5), substantially in the opposite direction to that of said movement (m1), the tool (4b) is engaged in the milling of the same said edge (2b), the tool (4a) being disengaged, an alternating contact of said tools (4a) and (4b) thereby being enabled.

2. A set as claimed in claim 1, characterised in that said shafts (3a) and (3b) are actuated in rotation by a single said electric motor (7), common therefor, means (10) for transmitting motion being provided between said single electric motor (7) and said shafts (3a) and (3b).

3. A set as claimed in claim 2, characterised in that said motion transmission means (10) consist of at least a belt that is wound, in a closed loop configuration, at least on arcs of the peripheries of elements (12) in the manner of pulleys respectively coaxial to said single electric motor (7) and to said shafts (3a) and (3b).

4. A set as claimed in any of the claims from 1 to 3, characterised in that said actuators (8) consist of a double-action pneumatic cylinder acting between said bed (6) and said moving element (5).

5. An operative set (1) for the milling grinding of edges (2b) of panels (2) on machines for working wood or the like, preferably on continuous-traversing beading machines, set comprising:

   - a pair of shafts (3a) and (3b), for supporting related end tools (4a) and (4b);

- means, configuring subsets or elements (5) of substantially integral members, said elements (5) being movable relative to a machine bed (6) and supporting, rotatorily relative to their own axis, said shafts (3a) and (3b) positioned mutually parallel;
- means (9) constituting respective kinematic chains, interposed between said bed (6) and each said moving element (5);
- actuators (8) for the activation of said kinematic chains and the consequent positioning of each of said moving elements (5) relative to said machine bed (6), acting substantially between it and said moving elements (5), and destined to cause their movements (m) for the engagement or disengagement of said tools (4a) or (4b) in the milling of said edges (2b) of said panels (2);
- rotating electric motors (7), supported by said moving elements (5), for actuating the rotation of said shafts (3a) and (3b), characterised in that said two tool holding shafts (3a) and (3b) are both supported by a single said moving element (5), common for them, and in that said means (9) in the manner of kinematic chains consist of an articulated quadrilateral (13) movable on a plane substantially normal to the axes of said shafts (3a) and (3b) and presenting the two rocker arms (13a) and (13b) articulated onto said bed (6), whilst said single moving element (5) is integral with the connecting rod (13c), so that with a movement (m3) of said quadrilateral (13) said tool (4a) is engaged in the milling of said edge (2b), the tool (4b) being disengaged, whilst with an angular movement (m4) of said quadrilateral (13), substantially in the opposite direction to that of said movement (m3), the tool (4b) is engaged in the milling of the same said edge (2b), the tool (4a) being disengaged, an alternating contact of said tools (4a) and (4b) thereby being enabled.

6. A set as claimed in claim 5, characterised in that said articulated quadrilateral (13) is an isosceles trapezoid, where said connecting rod (13c) is one of the bases thereof.

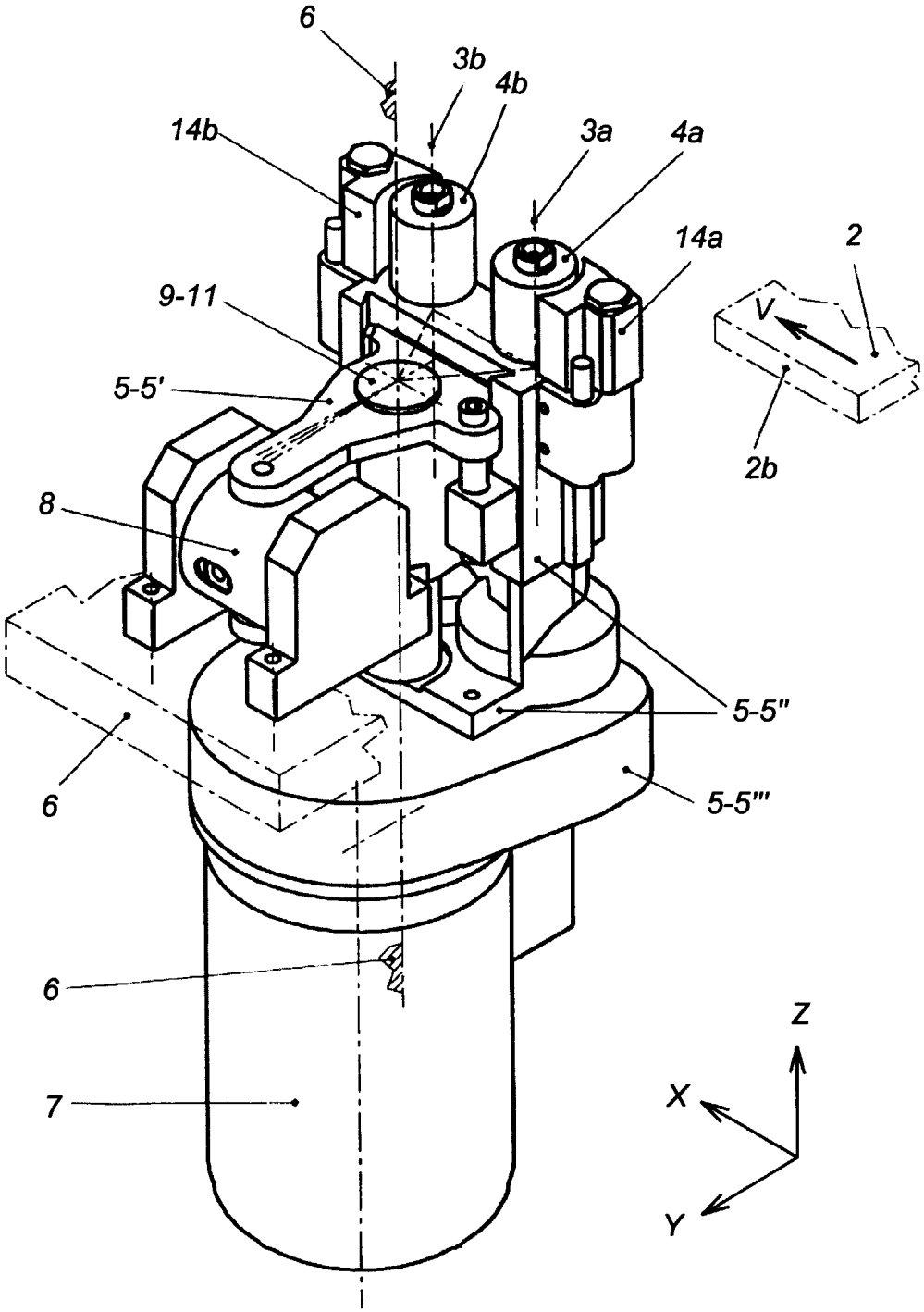
7. A set as claimed in claim 5 or 6, characterised in that said shafts (3a) and (3b) are actuated in rotation by a single said electric motor (7) common therefor, means (10) for transmitting motion being provided between said single electric motor (7) and said shafts (3a) and (3b).

8. A set as claimed in claim 7, characterised in that said motion transmission means (10) consist of at least a belt that is wound, in a closed loop configuration, at least on arcs of the peripheries of elements (12) in the manner of pulleys respectively coaxial to said single electric motor (7) and to said shafts (3a) and (3b).

9. A set as claimed in any of the claims from 5 to 8, characterised in that said actuators (8) consist of a double-action pneumatic cylinder acting between said bed (6) and said articulated quadrilateral (13).

10. A set as claimed in any of the previous claims, characterised in that to at least one of said tools (4a) or (4b) is associated a respective element (14a) or (14b) for tracing said edge (2b) undergoing the milling operation.

FIG.1



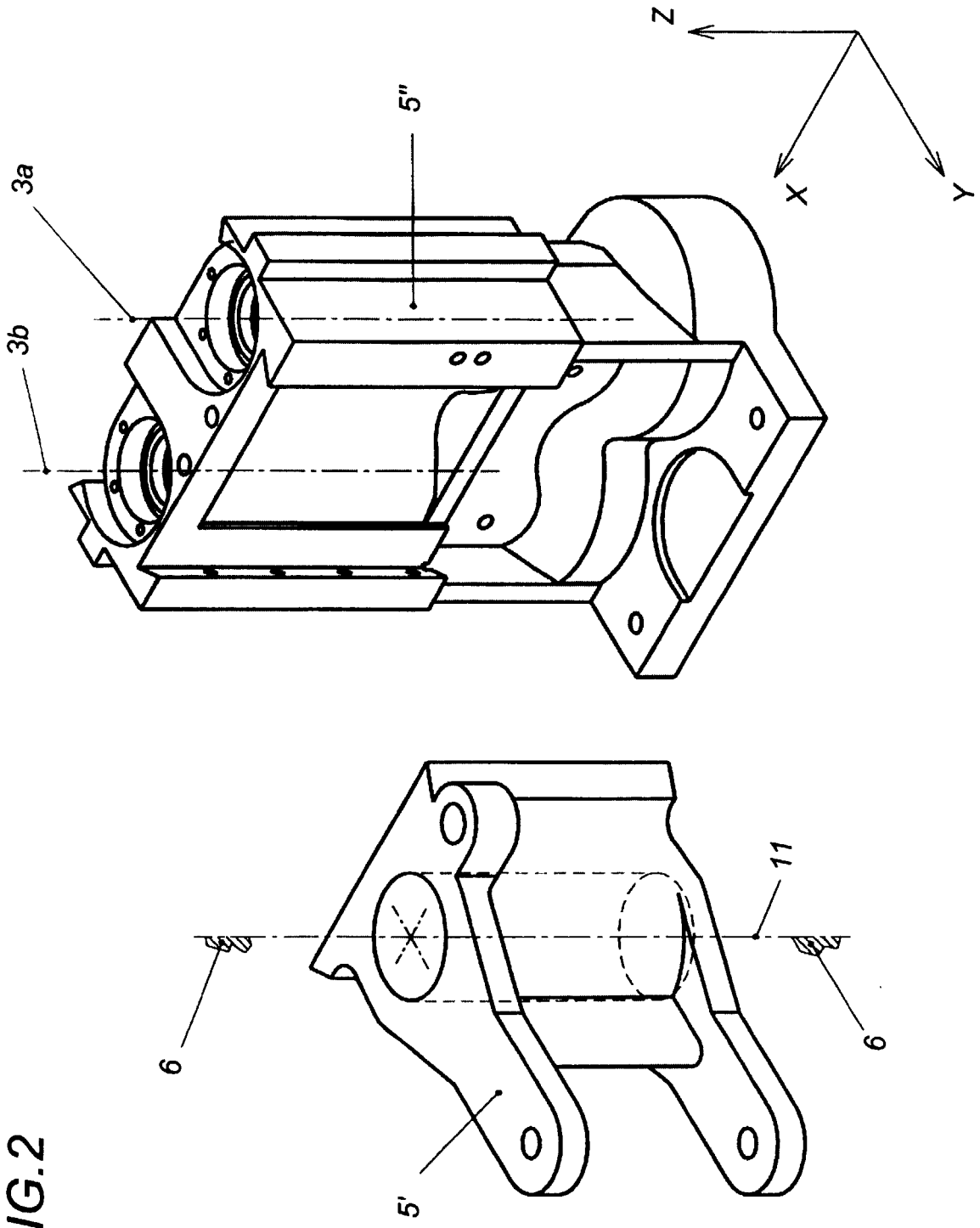


FIG.2

FIG.3

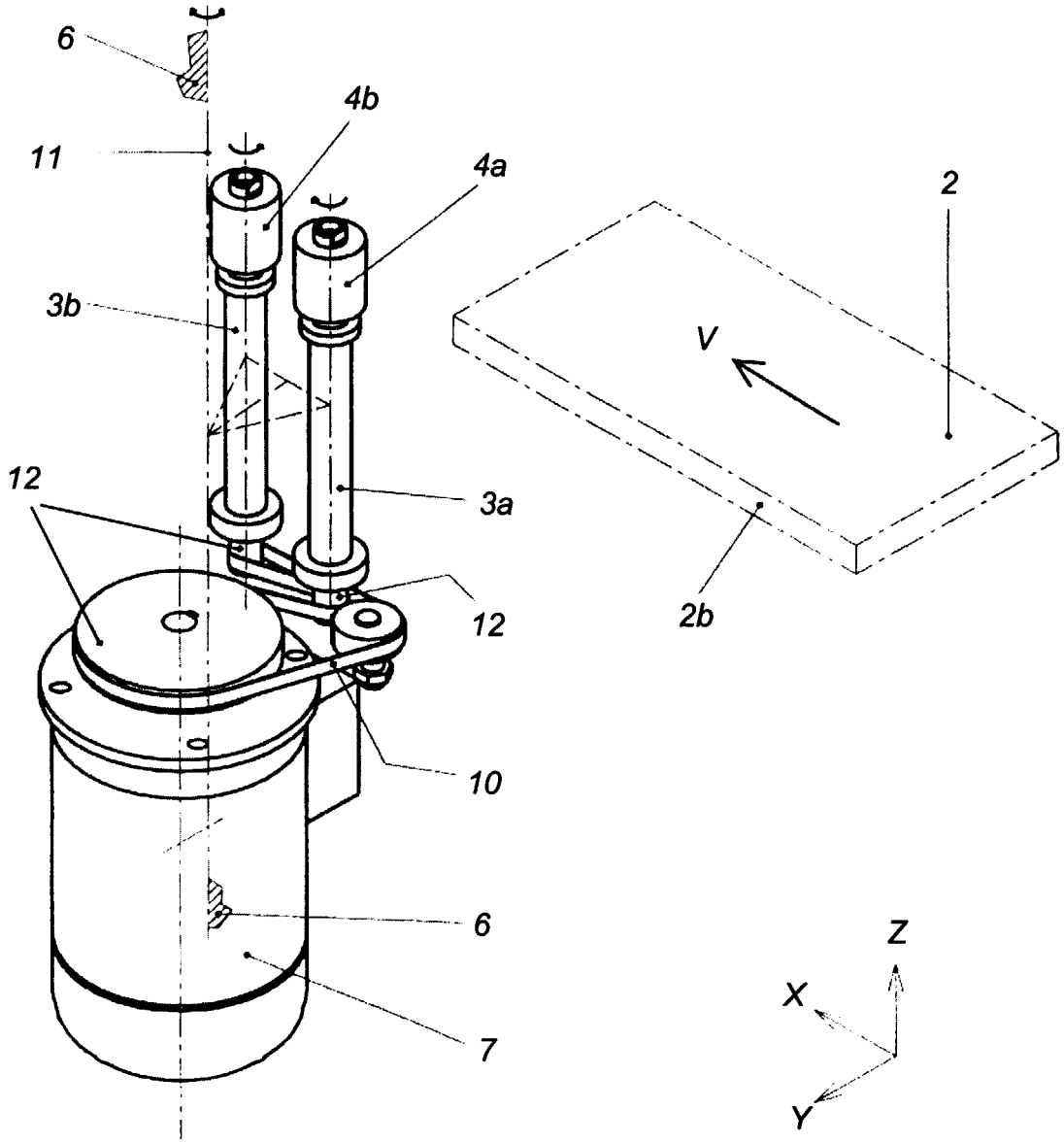


FIG.4

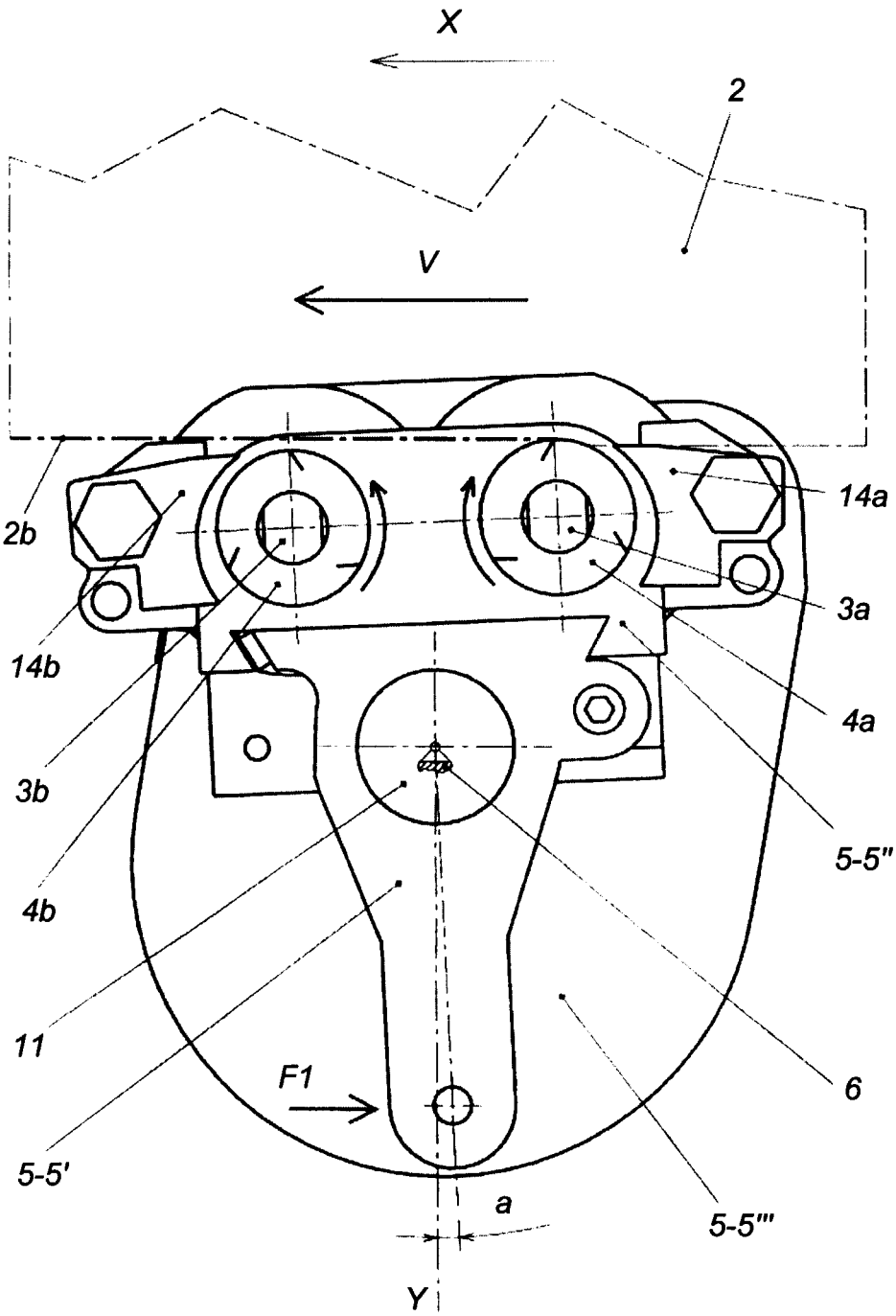
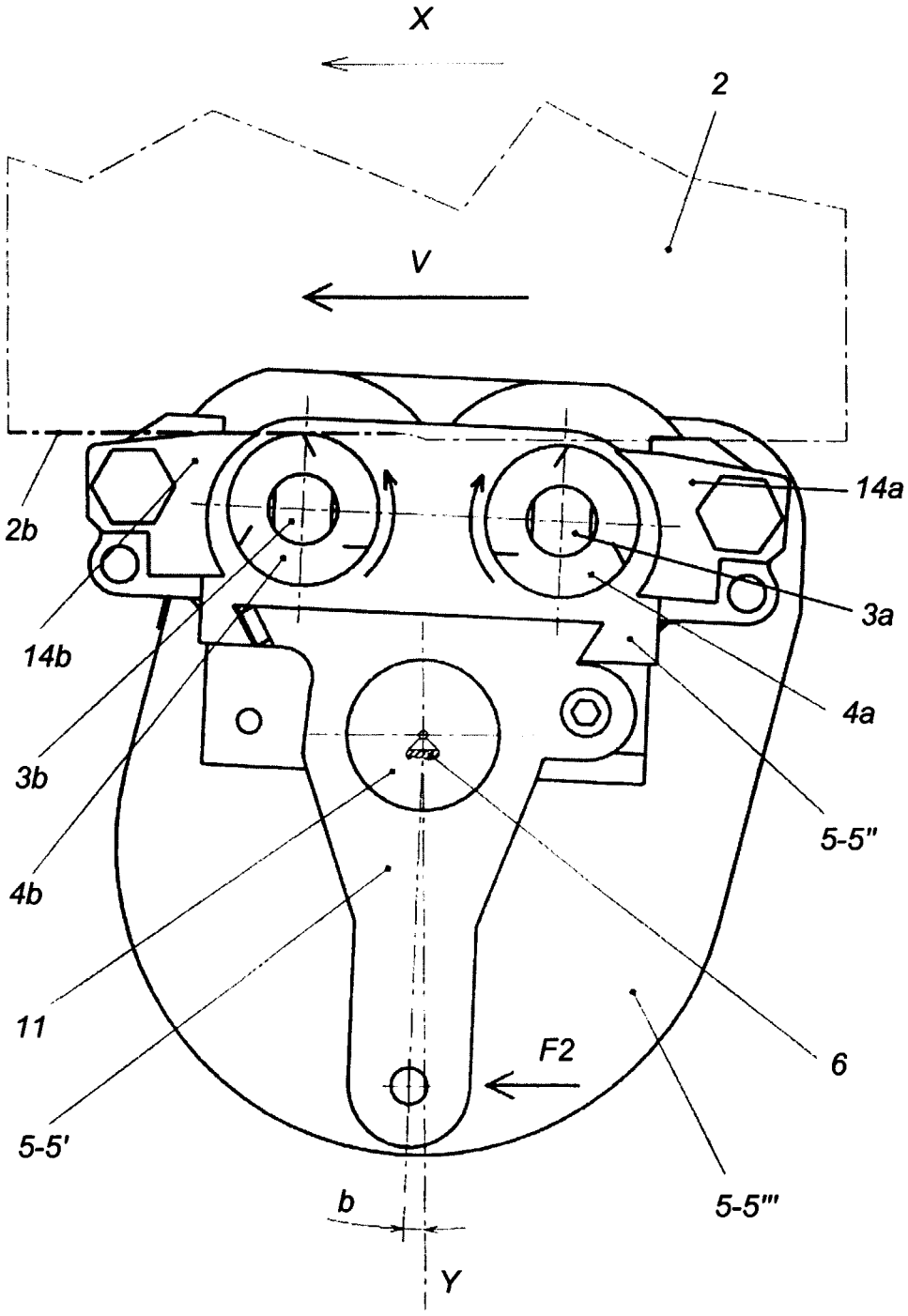


FIG.5



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EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0506

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	AT 249 980 B (REINBERG) * page 1, line 20 - line 29; claim 2; figures 6-8 *	1	B27G19/10 B27F1/02
Y		2-4,10	
Y	EP 0 606 052 A (BACCI PAOLINO DI GIUSEPPE BACC) 13 July 1994 (1994-07-13)	2-4	
A	* column 4, line 27 - line 39 * * column 4, line 46 - line 49; figure 3 *	7-9	
Y	DE 41 07 946 A (STEGHERR LUDOLF) 17 September 1992 (1992-09-17) * column 2, line 16 - line 24 * * column 2, line 29 - line 33; figure 5 *	10	
A	DE 38 15 101 A (WILHELM HIRSCH HOLZBEARBEITUNG) 16 November 1989 (1989-11-16) * claim 2; figure 1 *	1,5	
A	GB 1 232 876 A (RYE) 19 May 1971 (1971-05-19) * figures 1,2 *	5	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B27G B27F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 October 2000	Huggins, J

CATEGORY OF CITED DOCUMENTS

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17-10-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
AT 249980 B		NONE	
EP 0606052 A	13-07-1994	IT 1259719 B	25-03-1996
		DE 69312249 D	21-08-1997
		DE 69312249 T	18-12-1997
		ES 2106310 T	01-11-1997
DE 4107946 A	17-09-1992	NONE	
DE 3815101 A	16-11-1989	NONE	
GB 1232876 A	19-05-1971	NONE	

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