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(54) **A woodworking drilling machine with an improved panel feeding device**

(57) A drilling machine comprising a loading channel (1) defining a working plane and a feeding and loading direction (X) of a panel (P) to be processed; a drilling unit (4) arranged for operation in correspondence with the working plane (XY), said drilling unit being adapted to move close to and away from the panel (P) placed on the working plane so as to achieve operations on the panel itself; the machine comprises a feeding device for loading the panel in the feeding and loading direction. The feeding device comprises a single fixed feeder (2) a belt (21) arranged at a side of the loading channel parallel with the feeding and loading direction (X); the feeder further comprises first pressing means (22, 23) adapted to press the belt (21) against the panel along an axis (Z) that is orthogonal with the working plane (XY).

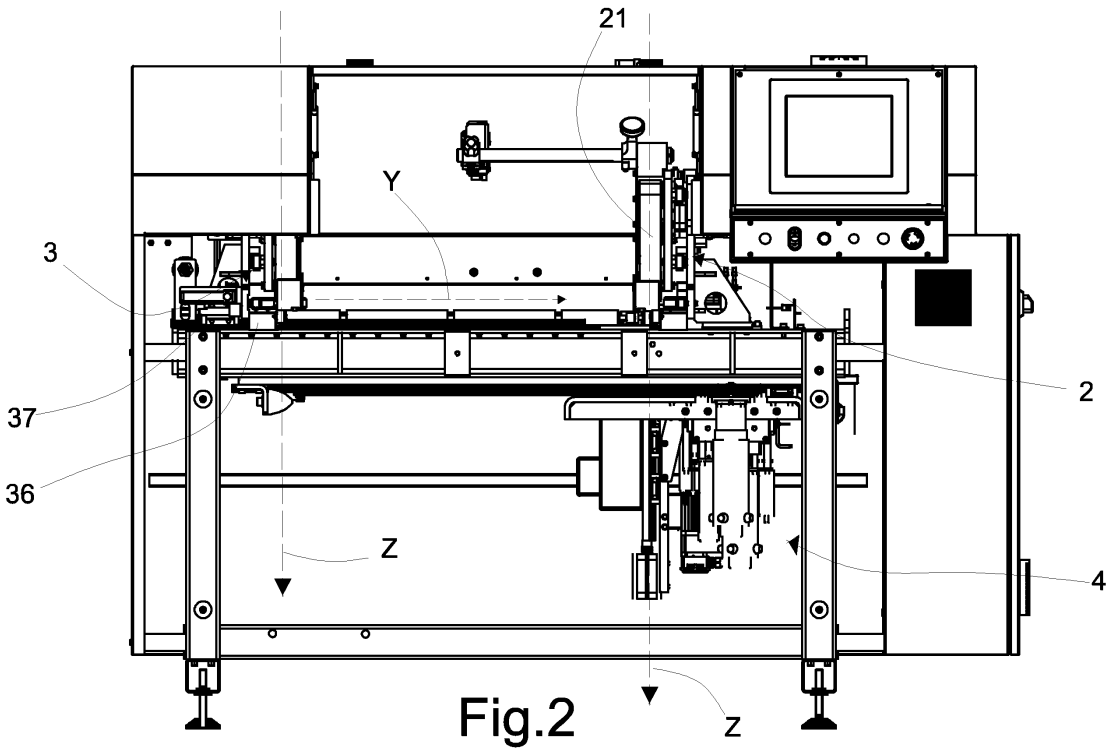


Fig.2

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Description

[0001] The present invention refers to the field of woodworking and in particular it concerns a feeding device for moving panels in a numerical control drilling machine.

[0002] It is known that, over recent years, it has become increasingly more common to use furniture made up of panels with standard dimensions produced in large batches and subsequently assembled so as to make the desired piece of furniture. Of course, this type of production makes it possible to substantially reduce the manufacturing costs and therefore also the end price of the furniture. Such types of furniture, therefore, have rapidly become widespread and are currently amongst the most popular ones.

[0003] As mentioned, the piece of furniture is assembled starting from panels, preferably made from solid wood or chipboard, having standard sizes and pre-processed with the slits, grooves and holes necessary for the connection with other panels, and also provided with finishing details, locks and other accessories in general. In particular, in a pre-processing step, holes are drilled so as to allow for the insertion of pins, the fastening of the hinge elements to the doors, or to allow for the arrangement of the locks and/or handles.

[0004] Such workings on the panels are carried out on numerical control workstations commonly known with the name "point-to-point drilling machines". The drilling machine is programmed with the mapping of the slits and holes to be made on the panel, which is displaced so as to translate on a plane inside the machine, positioning itself in correspondence with a tool-bearing head movable (at least) along a direction that is orthogonal with the aforementioned plane.

[0005] In order to permit the handling and the displacement of the panel, pneumatically operated pincers are normally used, being capable of gripping and holding the panel which is transported and positioned in correspondence of the various drilling steps that are managed by the numerical control. This type of feeding, although effective and very common, involves nonetheless a number of problems.

[0006] Firstly, the run of the pincer along the feeding direction is limited (generally the run is of about one metre, or slightly longer), due both to bulk and structural reasons. Consequently, when the panel is longer than the maximum run of the pincer, the machine must stop its working cycle, and the panel need be locked, while the pincer is disengaged, returns to its run start point, and grabs the panel again to proceed further with the subsequent drilling steps. Clearly, this operation is rather lengthy, and requires the panel to be grabbed many times. Therefore, in addition to the long working time and to the waste of energy, there is also the risk of damaging the finishing of the surface of the panel, when delicate surfaces like lacquered or enamelled boards are being processed.

[0007] A further problem in connection with the above described grabbing of the panel with a pincer is the following: when a hole to be formed is in a position occupied by the pincer, there is again a problem of mutually repositioning the pincer and the panel. This is a particularly serious problem when small sized panels are worked, since the fraction of surface occupied by the pincer, with respect to the overall panel surface, is significant.

[0008] Again a further problem is related to the fact that, when the processing to be carried out comprises the use of a disk-type milling cutter, for example to form a groove, if the panel has a length that exceeds the maximum run of the pincer, the panel is grabbed again by the pincer either with the tool remaining inserted in the groove under formation, or before lowering the tool and reinserting it in the groove. In both cases, in the point of contact with the tool, a scratching in the surface of the panel is formed. The result is a panel that does not have the desired finishing quality, being thus aesthetically unsatisfactory, and causes an economic detriment (since the damaged panel has lesser value).

[0009] The object of the present invention is therefore that of solving the aforementioned problems by providing a drilling machine with a compact and efficient feeding device, in particular in connection with working speed and productivity, irrespective of the dimensions of the panel.

[0010] A further object of the present invention is to provide a drilling machine with a panel feeding device that involves a reduced displacement of mass, and that is easier to control with respect to known systems.

[0011] Such objects are achieved with a drilling machine according to the invention, the essential characteristics of which are defined by the first of the attached claims.

[0012] The characteristics and the advantages of the drilling machine according to the invention shall become clearer from the following description of an embodiment thereof, given as an example and not for limiting purposes, with reference to the attached drawings, in which:

- figure 1 is an overall view of the drilling machine according to the invention in which an insertion channel and guides for the sliding of the panel are visible;
- figure 2 shows a front view of the drilling machine of figure 1, without a front protective cover and in which the components of the feeding device are indicated;
- figure 3 is a perspective view, from the side of the loading channel, of a fixed feeder of the feeding device according to the invention, represented in detail and isolated;
- figure 4 is a perspective view, again in detail and isolated, of the fixed feeder, from the opposite side with respect to that of figure 3;
- figure 5 represents a detail and isolated view from below and - for the sake of clarity - with a schematic representation of a panel being processed, of a movable stop device of a feeding device according to the invention; and

- figure 6 is a side view of the drilling machine without a side protective cover, in which the fixed feeder of figure 3 is highlighted with a circle.

[0013] With reference to the above figures, according to the invention a feeding device is integrated in a drilling machine or numerical control workstation for processing, and in particular for drilling, wooden panels (and/or the like) intended for the production of furniture. The overall characteristics of the drilling device are in accordance with the prior art; the machine, therefore, is neither illustrated nor described in detail.

[0014] As far as the present invention is concerned, it will be sufficient to note that the drilling device comprises a feeding or insertion channel 1 of a wooden panel P to be processed on a working plane, typically, like in the example, horizontal. The panel P (shown only schematically in figure 5) moves on said plane according to a loading and feeding direction X inside the drilling machine, until it becomes positioned in a working area of a tool-bearing head of a drilling unit (indicated with reference numeral 4 and visible in figures 2 and 6). The unit is placed below the feeding plane, so as to drill the panel itself.

[0015] The operation of the drilling unit is controlled by a numerical control system that, following a pre-programmed mapping of the holes and other workings to be made, drives the same unit; figure 1 shows generic interface means 100 of the numerical control (such as a screen and a keypad). The drilling unit, as mentioned, is positioned below the working plane and comprises a mounting head for the drill bits (or tools in general) which can be reciprocated from below towards the panel, so as to obtain a consequent advancement motion of the tool (the opposite movement corresponding to a tool return motion).

[0016] The insertion channel 1 is delimited sideways, i.e. along the sides parallel to the feeding and loading direction X, by a feeding device according to the invention comprising a fixed feeder 2 and a movable stop device 3; the latter is adapted to translate along a transversal direction Y that is perpendicular to said feeding and loading direction X, so as to reduce the distance (considered along said transversal direction Y) with the fixed feeder 2 and, therefore, to reduce the transversal spacing of the feeding device; in this way, the device can be adjusted in accordance with the width of the panel P to be processed.

[0017] Again with particular reference to figure 1, the fixed feeder and the movable stop device have guide members 20 and 30, respectively, which linearly extend along the feeding direction X. These guides are mounted so as to partially project outside the drilling device (and in particular from the channel 1); accordingly, they act as a support for the panel during the insertion inside the machine and assist the staff in the panel feeding operations.

[0018] The guides 20 and 30, in pairs arranged in a square-like fashion, are provided with rollers, or other analogous elements for reducing friction, so that the panel P, once it is supported by the guides themselves, can be pushed inside the channel until it engages with engagement and feeding means provided on the fixed feeder 2.

[0019] In greater detail, with reference to figure 3, such engagement and feeding means comprise a toothed belt 21 which acts from the above on the panel to be drilled, along one side thereof, under the effect of first pressing means. In particular such first pressing means comprise a lever system, such as, for example, a pantograph system 22 actuated, again purely as an example, by a pneumatic cylinder 23.

[0020] The cylinder 23, through the pantograph system 22, thus makes it possible to exert a pressure on the belt that is sufficient to keep the hold with the panel and to prevent a relative sliding between the belt itself and the panel. Through the belt, the panel P is pressed on the roller guide 20, said pressure also exerting a force that opposes the drilling thrust by the drilling tool. In fact, as previously mentioned, the drilling unit is positioned below the working plane, and most of the drilling operations are carried out with an upwards motion and consequent thrust. The opposing force that the pantograph lever system exerts is thus necessary in order to keep the panel P on the working plane and simultaneously promotes the correct execution of the drilling or milling procedures.

[0021] Feeding means such as an electric motor 24, e.g. a brushless motor or another analogous type of motor, controlled by the numerical control system of the drilling machine, drive the belt 21 into motion, thus transporting the panel P along the feeding and loading direction X, making it take up, step by step, the various work positions in correspondence with the drill bit or cutting blade tools, so that the processes can be carried out in the exact desired position.

[0022] As shown in figures 3 and 4, the belt 21 winds up on rollers 25 (smooth so as to ensure that permanent angles are not formed over the belt), including a drive roller 25a fed by the motor 24, projecting from a movable plate 2a. The plate 2a supports, on the opposite side with respect to that of the belt, the brushless motor 24. The rollers are arranged so as to follow - and thus making the belt take on - a substantially overturned U-shaped path, defining a central recess which prevents the risk of interfering with the working tools, in particular as far as sideways drilling operations are concerned.

[0023] A further pressing cylinder 27 is fixed to the movable plate 2a inside the path of the overturned U-shaped belt; this second pressure means 27, acting in turn with pressure on the panel through own idler rollers 27a, and pressing the same panel centrally, against the roller guides 20, exerts a further improved contrast to the vertical drilling operations.

[0024] The plate 2a is, as a whole, driven by the pantograph system 22 and is thus mobile along an axis Z

that is orthogonal with respect to the plane XY. As obvious, the belt faces towards the loading channel 1, so as to be able to contact the panel to be processed. An analogous rear plate 2b is placed parallel to the fixed plate 2a and is spaced from it, enough to allow both the pantograph leverage 22 and the pneumatic cylinder 23 to be housed in the gap thus obtained. The rear plate is steadily fixed, and the cylinder 23 is integrally mounted on it. Brackets 26 project from the rear plate 2b so as to allow the feeder unit to be fixed to the frame of the machine.

[0025] The movable stop device 3 (figure 5) is analogously equipped with second pressing means like a pantograph lever system 32 actuated in the direction Z by a pneumatic cylinder 33, so as to push a series of rollers 31 on the panel P, along the side opposite to that for engagement with the belt 21 of the fixed feeder 2. This opposite side of the panel becomes thus engaged between the rollers 31 and the guide 30. The entire group of the movable stop device 3 is slidable, manually driven through a handle 35, along the direction Y, on sliders 36 supported along guides 37 (figure 2). The handle 35 makes it possible for a staff worker, in charge of the loading/unloading operations, to grip the drilling device.

[0026] The rollers 31 are in this case idle (since they are not controlled by an actuator, be it electrical or mechanical) and, by contacting the panel P, make it possible to press it against the lower member of the pair of guides 30, so as to stabilize the engagement and feeding action.

[0027] Also in this case, for a drilling directed along the axis Z, in order to exert the due contrast to the force generated by the tool, a further pair of pressure rollers 39 is provided, actuated by a pressure cylinder (not visible in the figures). The rollers 39 are arranged, as shown in figure 5, in a central position with respect to the idler rollers 31, and, in normal conditions, are lifted from the panel, being lowered to come into contact with it only when an abutment opposing the drilling force generated along the axis Z is required.

[0028] As obvious, the movement of the movable stop device can also be of the automatic type instead of manual, for example controlled electronically by the same numerical control which manages the workstation. In this case, in order to allow for the correct movement towards the panel and its positioning, appropriate positioning control systems will be implemented. Analogously, electronic control means can also equip the fixed feeder, for example, to control the movement of the pantograph lever system.

[0029] Both on the movable stop device 3 and on the fixed feeder 2, respective protection elements 28 and 38 prevent the accidental insertion of hands or fingers of a worker inside the feeding device.

[0030] Advantageously, the invention makes it possible to obtain a continuous movement of the panel, and thus to efficiently feed the panel without interruptions regardless of the dimensions, with the use of a single feeder equipped with a belt (that is, the fixed feeder 2), considerably simplifying the feeding system of the machine, without needing complex transmission systems and thus also with a substantial reduction of inaccuracies due to mechanical plays.

[0031] In order to displace and arrange the wooden panel at the desired drilling positions, there is therefore no need to grab the same a number of times, like in the case of the conventional pincer grabbing devices, with a considerable reduction of both errors in positioning and of risks of ruining the surface finish of the panel.

[0032] The operation is completely efficient thanks to the movable stop device 3 which allows for the necessary containment to be obtained, so that the panel P can be transported in a correct and stable manner.

[0033] Moreover, it is possible to process both small and large panels, without distinction, without requiring to modify the engagement system; consequently, there is a considerable reduction in working times and, consequently in costs. Differently from pincer grabbing systems, big sized panels can be processed (even longer than 2 metres, for example) in a single run (with a quicker and more cost-effective production), without no bulk increase of the machine.

[0034] The present invention has been described thus far with reference to its preferred embodiments. It should be understood that other embodiments can exist which belong to the same inventive core, all covered by the scope of protection of the attached claims.

Claims

1. A woodworking drilling machine comprising a loading channel (1) defining a working plane (XY) and a feeding and loading direction (X) of a panel (P) to be processed, a drilling unit (4) being arranged for operation in correspondence with said working plane (XY), said drilling unit (4) being adapted to move close to and away from said panel (P) placed on said working plane (XY), the machine comprising a feeding device for loading said panel along said feeding and loading direction and being **characterized in that** said feeding device comprises only one single fixed feeder (2) with a belt (21) arranged at a side of said loading channel parallel with said feeding and loading direction (X), the feeder (2) comprising first pressing means (22, 23) adapted to press said belt (21) against said panel along an axis (Z) orthogonal with said working plane (XY).

2. The drilling machine according to claim 1, wherein said feeding device further comprises a movable stop device (3) arranged on the opposite side of said loading channel (1) with respect to said fixed feeder (2), said movable stop device (3) comprising second pressing means (32, 33, 31) operating on said panel along said axis (Z).

3. The drilling machine according to claim 2, wherein

the position of said movable stop device (3) is adjustable along a transversal direction (Y) perpendicular with said feeding and loading direction (X).

4. The drilling machine according to claim 3, wherein said movable stop device (3) comprises a handle (35) for permitting the grip and the driving of said stop device along said transversal direction (Y), by a manual action.

5. The drilling machine according to any of the previous claims, wherein said belt (21) substantially follows an overturned U-shaped path defining a central recess adapted to prevent interference with the working tools.

6. The drilling machine according to any of the previous claims, wherein said fixed feeder (2) comprises a plurality of rollers (25) around which said belt (21) winds up, said rollers projecting from a movable plate (2a), said first pressing means (22, 23) comprising a pneumatic cylinder (23) mounted on a fixed plate (2b) and driving said movable plate (2a) through a drive comprising a pantograph lever system (22) arranged between said two plates.

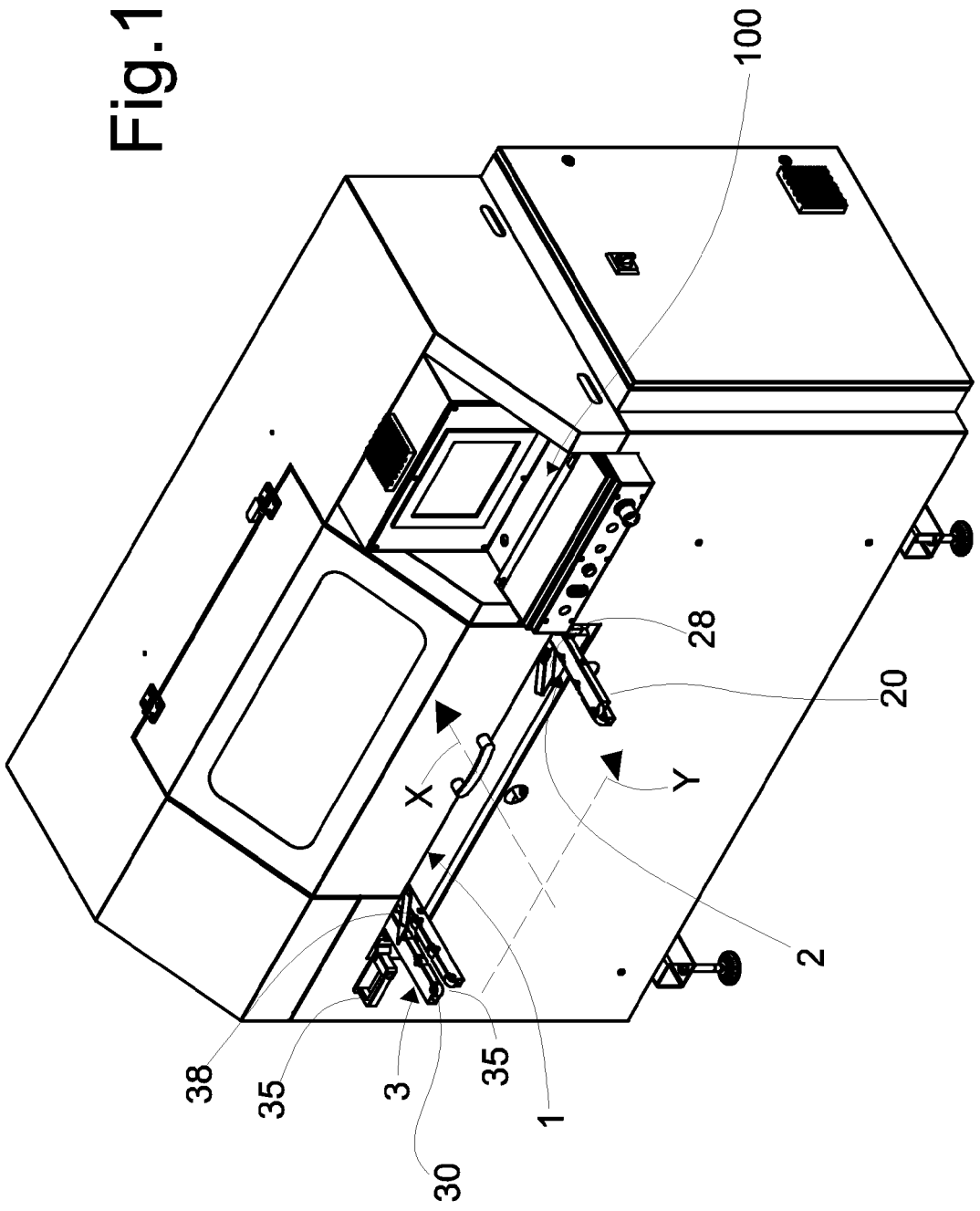
7. The drilling machine according to claim 5, wherein said fixed feeder (2) further comprises a brushless electric motor (24) fixed to said movable plate (2a) and driving a drive roller (25a) of said rollers (25).

8. The drilling machine according to any of the claims from 2 to 7, wherein said second pressing means comprise a pneumatic cylinder (33), a plurality of idler rollers (31) displaced along said axis (Z) by said pneumatic cylinder (33) in order to be pressed against said panel via a pantograph lever transmission system (32), said idler rollers (31) being linearly arranged along said feeding and loading direction (X).

9. The drilling machine according to any of the claims from 2 to 8, wherein said movable stop element (3) and said fixed feeder (2) comprise roller guides (20, 30) coupled and arranged in a square-like fashion, said roller guides linearly extending along said feeding and loading direction (X), said roller guides being adapted to provide a lower and side support to said panel.

10. The drilling machine according to any of the previous claims, wherein further pressure means (27, 27, 39) are provided respectively on said fixed feeder (2) and said movable stop element (3), adapted to be selectively driven to exert a central pressing force on said panel (P) against said guides (20, 30) in opposition to a drilling stress exerted on the panel along said orthogonal axis (Z).

Fig.1



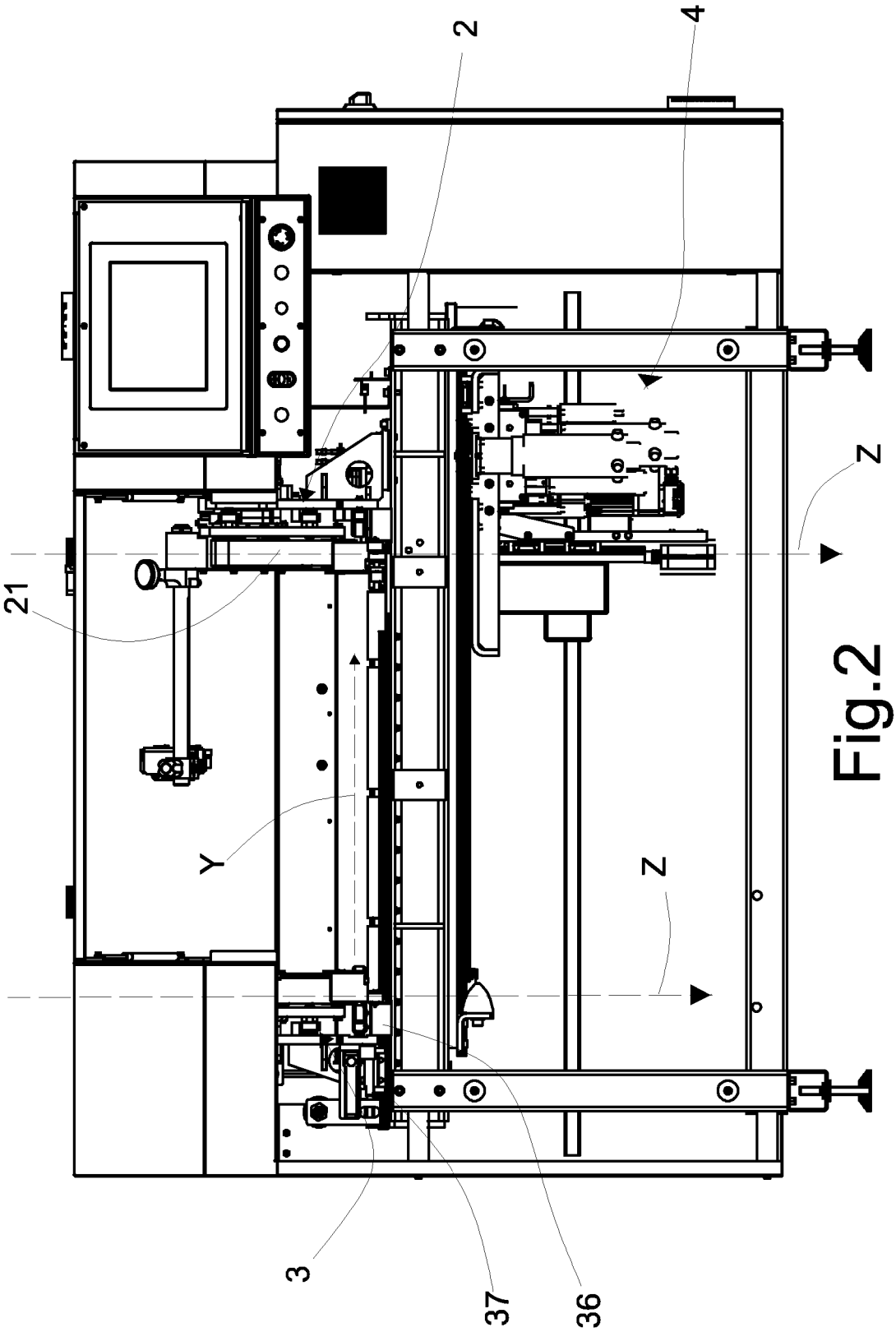


Fig.2

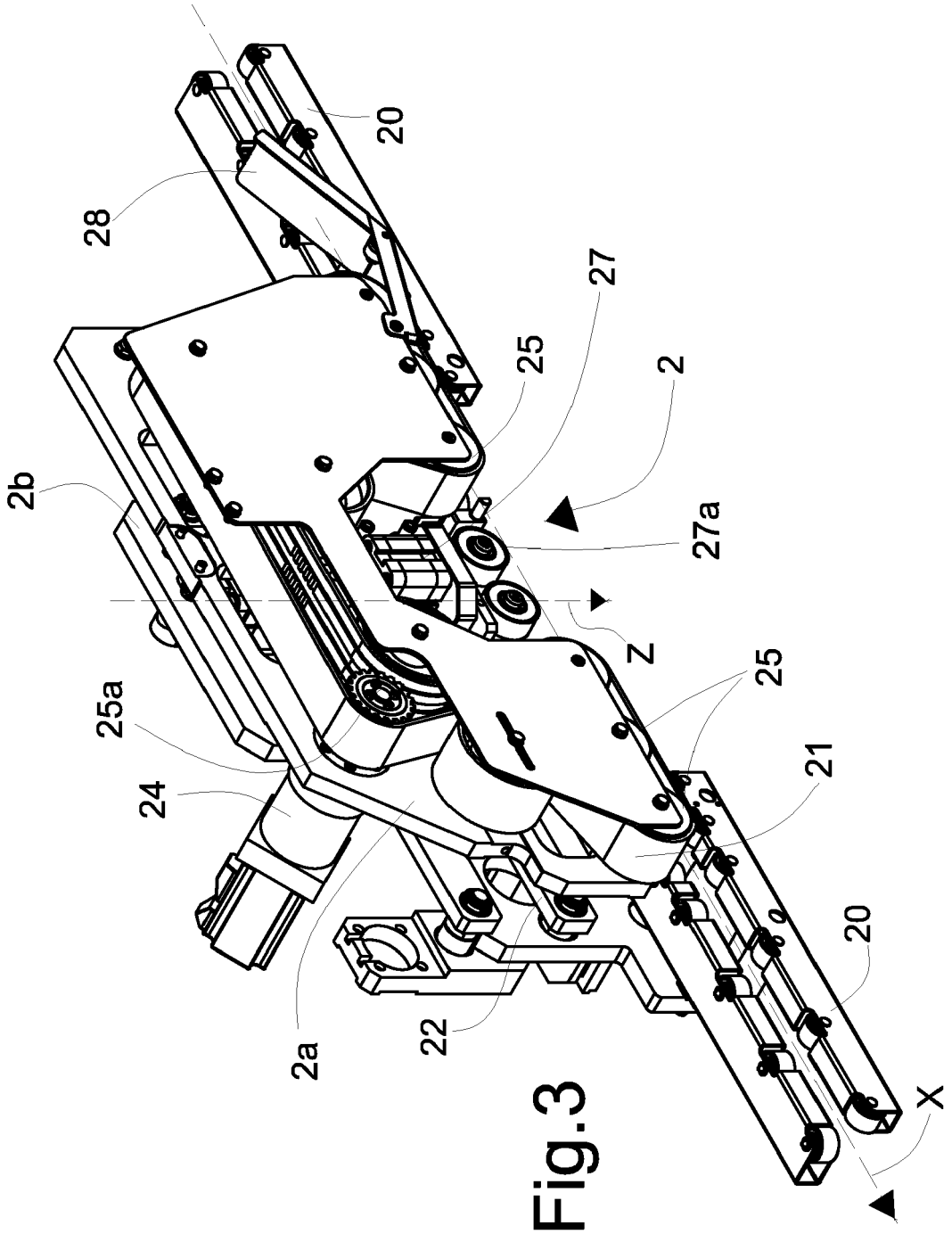


Fig.3

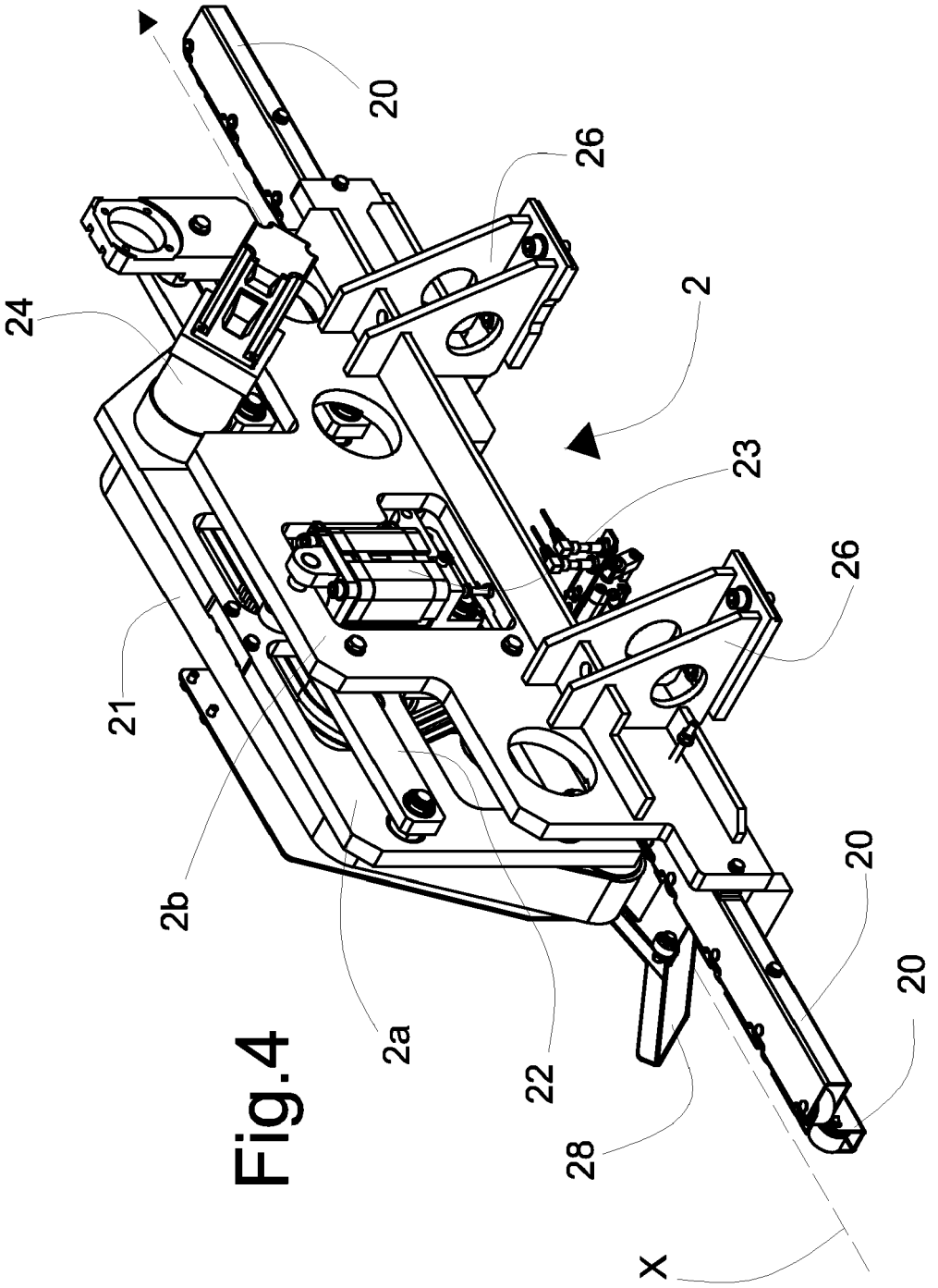


Fig.4

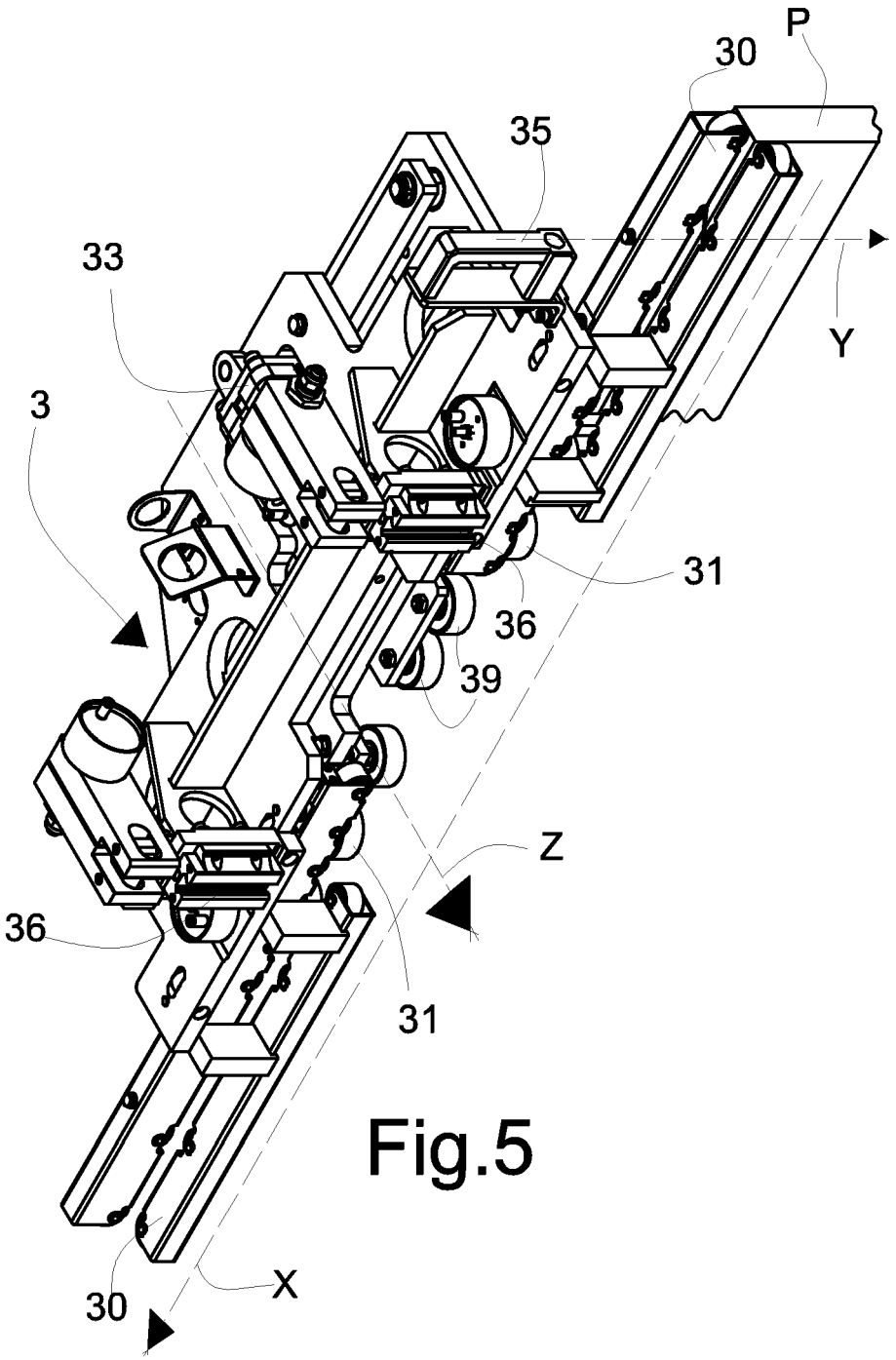


Fig.5

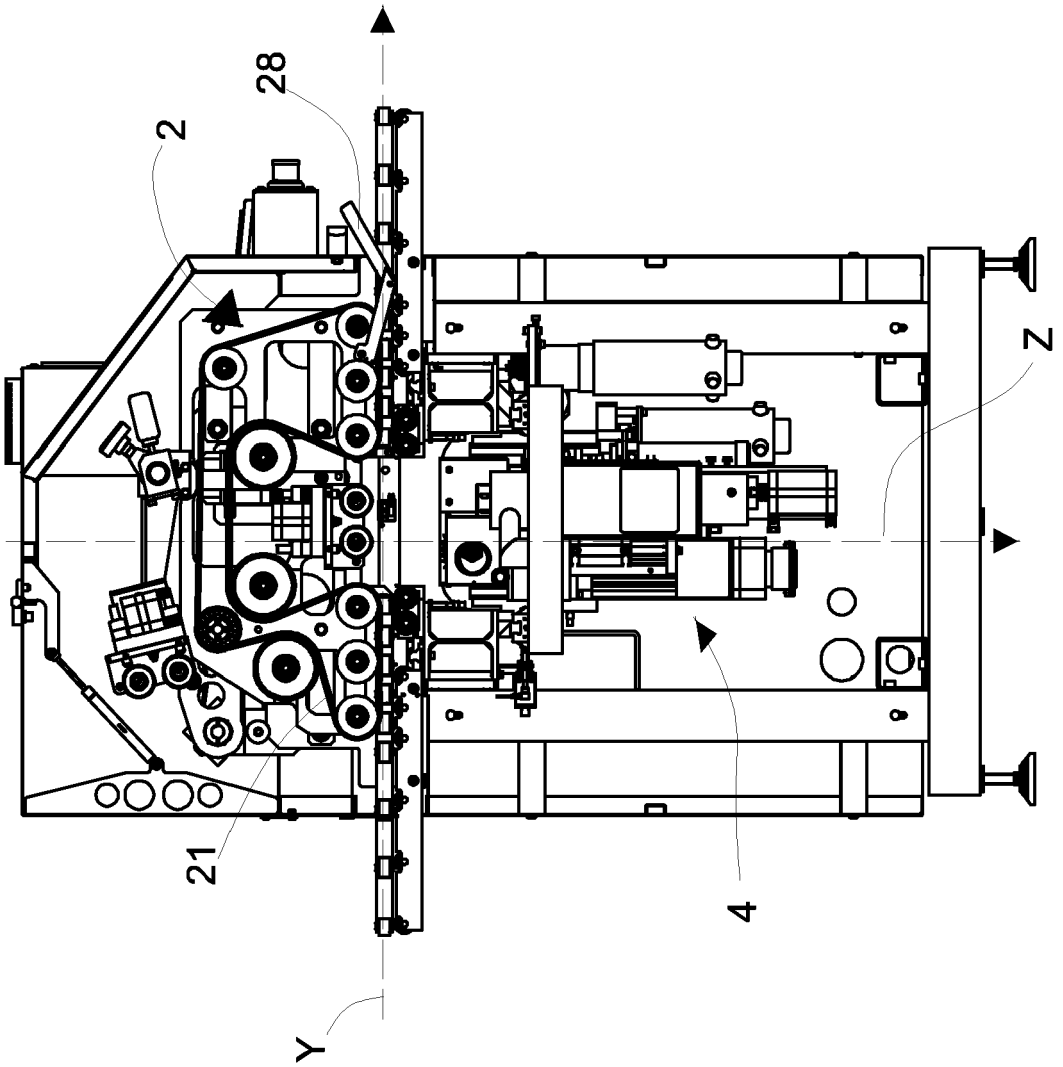


Fig.6

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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 5042

DOCUMENTS CONSIDERED TO BE RELEVANT

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A	NL 1 021 782 C2 (MARINUS MACHB BEHEER B V [NL]) 6 May 2004 (2004-05-06) * abstract * * page 3, line 24 - page 3, line 28 * * figure 2 *	3	TECHNICAL FIELDS SEARCHED (IPC) B23Q B27C B27M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 October 2011	Hamel, Pascal

CATEGORY OF CITED DOCUMENTS

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