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(54) **Edge-banding machine**

(57) An edge-banding machine (1) for edge-banding a workpiece (2) to be machined made of wood or similar materials comprises a plurality of operating units (101, 102, 103, 104) arranged on an advancement path (P) of said workpiece (2) to apply a laminar element to an edge of said workpiece (2).

In order to obtain a compact edge-banding machine (1) that is constructionally simple and economic, in which

said workpieces (2) to be machined are advanced with regular motion and are retained in a firm and effective manner, a conveyor belt (12) is provided that is configured for advancing said workpiece (2) to be machined in an advancement direction (X) along said advancement path (P).

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Description

[0001] The invention relates to edge-banding machines, in particular of the linear monolateral type, for edge-banding workpieces made of wood or similar materials.

[0002] Edge-banding machines are known for applying and gluing edges to profiles of workpieces, for example panels, tables, wings, doors, etc, made of wood or similar materials.

[0003] Known edge-banding machines have so far comprised, for example, the compact automatic edge-banding machine Olympic K200® of the same applicant.

[0004] This known machine comprises a chain closed in a loop around a driving roller - which drives the chain - and around one or more driven rollers. This chain is made by connecting together a plurality of tracks, each with a rectangular shape and provided with a surface coated with a polymeric material. An upper portion of the chain, substantially horizontal, extends along a longitudinal direction of the machine in an operating zone of the machine and is arranged for supporting and advancing the workpieces to be machined. This known machine further comprises a presser having a parallelepipedon shape extending longitudinally at the operating zone that carries a plurality of rollers for exerting a thrust in a vertical direction on the workpieces to maintain the workpieces to be machined pressed against the chain.

[0005] The known machine further comprises, at the operating zone, a plurality of operating units arranged in sequence along the longitudinal direction in a lateral position with respect to the chain and to the presser. In particular, this machine comprises a gluing unit for gluing an edge to the workpiece, a cutter unit to cut an edge portion protruding laterally with respect to the workpiece, a trimming unit for trimming the edge with respect to the workpiece by removing the material protruding above and below the workpiece, scraping units for eliminating glue residue and finishing the connection between the edge and the machined workpiece and a brush unit for cleaning and polishing the edge.

[0006] The known edge-banding machine further comprises a feeder for housing the edge to be applied to the workpiece, generally in the shape of a reel of plastics.

[0007] One drawback of the known edge-banding machine is that the aforesaid chain does not enable great friction to be obtained to retain on the chain the workpieces being machined. For this reason, it is necessary for the presser to exert a very great thrust on the workpiece to ensure firm positioning of the latter on the chain during machining. On the other hand, such a great thrust could leave visible marks or grooves on an upper surface of the workpiece, thus spoiling the aesthetic appearance thereof.

[0008] A further drawback of the known machine is that such chains do not ensure regular motion of the workpieces. In fact, near the rollers around which the chain is closed, the tracks of the chain are arranged such as

to form a polygonal broken line. This causes an irregular motion of the workpiece, in particular an indexed motion characterised by accelerations and braking such as to lower the precision and accuracy of the machinings.

[0009] A still further drawback of the known machine is that such chains are costly, and moreover mounting them on the machine requires great precision and thus great mounting time and costs.

[0010] One object of the invention is to improve known edge-banding machines.

[0011] A further object is to obtain an edge-banding machine in which the workpieces are moved through the operating zone with regular motion.

[0012] A still further object is to obtain an edge-banding machine in which the workpieces are retained in a firm and effective manner.

[0013] Another object is to obtain an edge-banding machine that performs machinings on the workpieces with great precision. Still another object is to obtain an edge-banding machine for edge-banding workpieces ensuring good aesthetic quality of the edge-banded workpiece, i.e. an edge-banding machine that performs machinings on the aforesaid appearance without ruining the appearance.

[0014] Another still further object is to obtain an edge-banding machine that is constructionally simple and cheap.

[0015] These and still other objects are all achieved by an edge-banding machine that is made according to any one of the claims set out below.

[0016] The invention can be better understood and implemented with reference to the attached drawings that illustrate an embodiment thereof by way of non-limiting example, in which:

Figure 1 is a perspective view of an edge-banding machine according to the invention;

Figure 2 is a frontal view of the machine in Figure 1; Figure 2A is a partial and enlarged frontal view of pressing means in an operating zone of the machine in Figure 1;

Figure 3 is a partial and schematic side view of a portion of the machine in Figure 1, in which certain elements are shown in cross section;

Figure 4 is an enlarged detail of Figure 3.

[0017] With reference to Figures 1 and 2 there is shown an edge-banding machine 1, in particular of the linear monolateral type, for edge-banding workpieces 2 to be machined, for example made of wood or similar materials.

[0018] The edge-banding machine 1 may comprise a feeder 3, optionally of circular shape, arranged for supporting a laminar element in the form of a reel (which is not shown), to be applied to an edge of the workpiece 2.

[0019] The edge-banding machine 1 may further comprise a frame 4, optionally supported by a plurality of foot elements 5, that rest on a floor of a room in which the

machine 1 is located. The frame 4 can comprise a lower portion 6 that is contiguous with the foot elements 5, which is optionally hollow so as to define internally a cavity of substantially prismatic shape. In this cavity, which is optionally divided into several cavities that are adjacent to one another, can be housed, in particular, a large part of the electric cables that are necessary for the operation of the machine 1. Further, this cavity can receive a tank (which is not shown) containing an adhesive substance, typically glue, used for gluing the laminar element to the workpiece 2.

[0020] The frame 4 may further comprise an upper portion 7, which is also optionally hollow so as to define, in the interior thereof, a further cavity of substantially prismatic shape. The upper portion 7 can receive a plurality of operating units 101, 102, 103, 104 (shown partially in Figure 2 and disclosed in greater detail below) arranged for performing subsequent machinings on the workpiece 2.

[0021] The lower portion 6 and the upper portion 7 can be separated by an operating zone 8, in which the workpiece 2 is machined. The operating zone 8 is then substantially bound above by the upper portion 7 and below by the lower portion 6.

[0022] The edge-banding machine 1 may comprise conveying means 9 for advancing the workpiece 2 along an advancement path P from an inlet zone 10 to an outlet zone 11 of the machine 1. In the advancement path P, which is optionally substantially parallel to an advancement direction X, the workpiece 2, as it advances, is subjected to subsequent machinings performed by the aforesaid plurality of operating units 101, 102, 103, 104 mounted on the machine 1.

[0023] The conveying means 9 may comprise a conveyor belt 12 closed in a loop around a driving roller 13, around a first idle roller 14 and around a second idle roller 15, the latter being arranged in particular to maintain the conveyor belt 12 tensioned. The driving roller 13 can be driven by gearmotor means 24, shown in Figure 3.

[0024] The workpiece 2, as it advances along the advancement path P, can be maintained pressed against the conveyor belt 12 by pressing means 41, shown enlarged in Figure 2A. The pressing means 41, comprising, for example, a plurality of rollers 42, exerts on the workpiece 2 a downward thrust in a substantially vertical direction.

[0025] The conveyor belt 12 can be, for example, a conveyor belt of commercial type that is substantially similar to the conveyor belts used in the ceramic tile processing industry to advance tiles. In particular, the conveyor belt 12, a section of which is shown in greater detail in Figure 4, may comprise a plurality of layers, each of which is suitable for bestowing on the conveyor belt 12 particular mechanical and/or physical and/or chemical properties. It should be known that it is possible to define an operating portion 12a of the conveyor belt 12 like that portion of the conveyor belt 12 facing the operating zone 8.

[0026] The conveyor belt 12 shown in Figure 4 may comprise a first external layer 16, for example made of an elastomer, configured for being brought into contact with the workpiece 2 to be machined. In other words, a lower surface 17 of the workpiece 2 rests on a contact surface 18 of the first layer 16.

[0027] The conveyor belt 12 may further comprise a second layer 19, adjacent to the first layer 16 and, for example, made of a material comprising a double fabric that ensures the good tensioning and supporting features of the conveyor belt 12. The conveyor belt 12 may also comprise a third layer 20, adjacent to the second layer 19, and, for example, made of an elastomer, possibly having features that are different from the elastomer with which the first layer 16 can be made. The third layer 20 can be brought into contact laterally with a lateral containing element 30 that, as will be explained better below, limits side movement of the conveyor belt 12.

[0028] The conveyor belt 12 may comprise a fourth layer 21, adjacent to the third layer 20, and, for example, made of fabric, in particular with fibres of so-called "Turkish cotton", for bestowing on the conveyor belt 12 good ability to slide on a resting plane 22. In use, the resting plane 22 can be brought into contact with a sliding surface 23 of the fourth layer 21, that thus slides on the resting plane 22.

[0029] It should be noted that the conveyor belt 12 is bounded by a contact surface 18, operationally brought into contact with the workpiece 2, and by a sliding surface 23, opposite the contact surface 18, and slidable on the resting plane 22. The contact surface 18 defines a conveying plane 25 on which the workpiece 2 is advanced along the advancement path P.

[0030] In other words, in use, the first layer 16 is interposed between the workpiece 2 and the second layer 19, the second layer 19 is interposed between the first layer 16 and the third layer 20, the third layer 20 is interposed between the second layer 19 and the fourth layer 21, and the fourth layer 21 is interposed between the third layer 20 and the resting plane 22.

[0031] The resting plane 22, extending substantially along the advancement direction X, comprises a coupling surface 26, in contact with, and on which, the sliding surface 23 of the fourth layer 21 of the conveyor belt 12 slides. In particular, it should be noted that the operating portion 12a of the conveyor belt 12 slides on the resting plane 22. In order to promote the operating portion 12a to slide on the resting plane 22, the coupling surface 26 can be subjected to mechanical machinings that confer a good surface quality to the coupling surface 26.

[0032] The resting plane 22 can be fixed to an elongated element 27, for example a hollow steel bar with a substantially square section shown in greater detail in Figure 3. This elongated element 27 can extend prevalently along the advancement direction X optionally between the driving roller 13 and the first idle roller 14 and can support the resting plane 22.

[0033] The elongated element 27 can be supported by

a fixed bar connected to the frame 4. From the bar, substantially at a median zone of the bar, an arm extends that rotatably supports the second idle roller 15, which in turn comes into contact with the conveyor belt 12, tightening the conveyor belt 12. In particular the second idle roller 15, just like the first idle roller 14 and the driving roller 13, come into contact with the sliding surface 23 of the fourth layer 21 of the conveyor belt 12.

[0034] The aforesaid lateral containing element 30 can be fixed to the elongated element 27, the aforesaid lateral containing element 30 being in particular made of plastics, such as, for example, polyethylene. The lateral containing element 30 can extend alongside the operating portion 12a of the conveyor belt 12 along the advancement direction X substantially for a length that is equal to that of the elongated element 27 and can be fixed to the latter by a plurality of fixing means 31, in particular threaded screws. The lateral containing element 30 can be brought into contact laterally, for example with the fourth layer 21 and with a portion of the thickness of the third layer 20 at a lateral contact surface 20a, as shown in Figure 4. In particular, the lateral containing element 30 can be brought into contact laterally with an appropriate portion of the thickness of the conveyor belt 12 so as to lock the conveyor belt 12 and limit movements of the conveyor belt 12 along a direction Y, that is substantially transverse to the advancement direction X.

[0035] It should be noted that the lateral containing element 30 is optionally arranged so as to be at a lower vertical height than the conveying plane 25 defined by the contact surface 18 on which the workpiece 2 rests.

[0036] The edge-banding machine 1 may further comprise a supporting bar 32, extending optionally for a length substantially equal to the length of the machine 1 along the advancement direction X. The supporting bar 32 is movable along the direction Y to support the workpiece 2 to be machined in cooperation with the operating portion 12a of the conveyor belt 12. As shown in Figure 1, the supporting bar 32 is optionally movable by axially slidable coupling, for example of the type with a bar that is slidable within a cylindrical or prismatic guide. In particular, the coupling may comprise, optionally at opposite ends of the edge-banding machine 1, a guide 33 and a bar 34 that slides inside the guide 33 and is optionally fixed to connecting portions 35 of the supporting bar 32. In other words, the guides 33, optionally fixed to the lower portion 6 of the machine 1, guide the movement of the respective bars 34 along the direction Y.

[0037] The supporting bar 32 comprises a plurality of rolling elements 36, in particular cylindrical rollers, on the side surfaces of which the workpiece 2 to be machined can slide. It should be noted that the contact points between these rolling elements 36 and the workpiece 2 are substantially comprised in the conveying plane 25.

[0038] The edge-banding machine 1 may comprise an encoder 37 (Figure 1) optionally mounted coaxially on a shaft of the first idle roller 14 to detect an angular position of this shaft and thus of the first idle roller 14.

[0039] Optionally, the encoder 37 can be supported by a plate 38 fixed to the elongated element 27 and to the aforesaid shaft, as shown in Figure 1.

[0040] With reference to Figure 1, the edge-banding machine 1 may further comprise a control and management unit 39 for controlling and commanding the plurality of operating units 101, 102, 103, 104 that operate on the workpiece 2 and the conveying means 9, in particular the advancement of the conveyor belt 12. The control and management unit 39 can be further arranged for receiving the electric signals sent by the encoder 37 that indicate the angular position of the first idle roller 14, and consequently the advancement of the conveyor belt 12. It should be noted that the encoder 37, mounted on the first idle roller 14, enables the position of the conveyor belt 12 to be detected, considering this position substantially coinciding with the angular position of the first idle roller 14.

[0041] Further, the machine 1 can be provided with an interface 40 by means of which an operator can insert the parameters of the workpiece 2 to be machined and of the machinings to be performed inside the control and management unit 39.

[0042] In use, the edge-banding machine 1, in particular of the linear monolateral type, enables a laminar element to be applied to an edge of a workpiece 2 to be machined, for example that is made of wood or similar materials, i.e. enables the workpiece 2 to be edge-banded.

[0043] Initially, the operator positions the laminar element, which possibly is in form of a reel, on a feeder 3 of the edge-banding machine 1. It should be noted that this operation might not be necessary if the laminar element with which the workpiece 2 has to be edge-banded is the same as the one used to edge-band other workpieces that have just been machined.

[0044] Further, the operator adjusts, generally manually, the position of a supporting bar 32 along a direction Y in function of the size of the workpiece 2 to be machined in the direction Y, i.e. in function of the width of the workpiece 2.

[0045] Subsequently, the operator positions the workpiece 2 at an inlet zone 10 of the edge-banding machine 1 by resting the workpiece on an operating portion 12a of a conveyor belt 12 and on the supporting bar 32.

[0046] When gearmotor means 24 drives the conveyor belt 12, the workpiece 2 advances along an advancement path P that is substantially parallel to an advancement direction X. In this manner, the workpiece 2 passes through an operating zone 8, in which the operating units 101, 102, 103, 104 comprised in the machine 1 perform successive machinings thereupon. It should be noted that during traversing of the operating zone 8, the workpiece 2 is maintained pressed against the operating portion 12a of the conveyor belt 12 by pressing means 41, for example comprising a plurality of rollers 42.

[0047] The operating units 101, 102, 103, 104 of the edge-banding machine 1 are generally that of known type

mounted on known edge-banding machines.

[0048] In particular, the aforesaid operating units 101, 102, 103, 104 comprise in succession along the advancement direction X: a gluing unit 101 for gluing the laminar element to an edge of the workpiece 2 to be machined, second pressing means 102 that is operationally arranged after the gluing unit 101 to press the laminar element against the edge of the workpiece 2 to be machined so as to fix to the workpiece 2 the laminar element. Also, the operating units 101, 102, 103, 104 comprise at least one operating unit 103 to remove material protruding laterally and/or above and/or below said edge from the laminar element fixed to the edge. In particular, the at least one operating unit 103 comprises a cutter unit for cutting a portion of laminar element protruding laterally with respect to the edge of the workpiece 2 and/or a trimming unit for trimming the laminar element with respect to the edge of the workpiece 2 by removing the material protruding above and below the edge of the workpiece 2.

[0049] The operating units 101, 102, 103, 104 further comprise optionally, at least one finishing unit 104 for performing surface finishing machinings on the edge of the workpiece. In particular, the finishing unit 104 comprises a scraping unit for finishing the edge of the workpiece 2, and, optionally, brushes for cleaning and polishing the edge of the workpiece 2 to which the laminar element has been applied.

[0050] Subsequently, the workpiece 2 exits the operating zone 8 at an outlet zone 11, from which the operator can remove the workpiece 2. At this point, a laminar element has been applied to an edge of the workpiece 2 and the tasks disclosed above have to be repeated for a number of times that is equal to the number of edges of the workpiece 2 that have to be edge-banded, thus generally another three times, so as to complete edge-banding of the workpiece 2.

[0051] Owing to the invention it is possible to obtain an edge-banding machine 1 of the linear monolateral type in which the workpieces 2 to be machined are moved with regular motion by the conveyor belt 12 through the operating zone 8. Further, the edge-banding machine 1, in which the pressing means 41 maintains the workpiece 2 to be machined pressed against the conveyor belt 12, retains the workpiece 2 in a firm and effective manner.

[0052] Further, the layers 16, 19, 20, 21 comprised in the conveyor belt 12 enable the latter to have the mechanical, physical and chemical features required by an user, for example a set mechanical resistance to traction, flexure and twisting, or a set resistance to stretching or particular anti-oil or anti-stain properties.

[0053] Also, the conveyor belt 12 can be mounted and dismounted by the operator in a very short time.

[0054] It should be further noted that the edge-banding machine 1 is constructionally simple and cheap.

[0055] The edge-banding machine 1 thus enables workpieces 2 to be edge-banded in a precise and accurate manner without ruining the workpieces being ma-

chined, i.e. without damaging the final aesthetic appearance thereof.

[0056] In one version of the invention that is not shown the conveyor belt 12 may comprise a number of layers other than four, in particular greater than four, or less than four. These layers can be made of materials that are different from one another, for example of fabric or of elastomer. In one particular case of this version, the belt 12 can also comprise only one layer, for example made of a material or of a mix of materials that bestow the belt 12 the particular mechanical, physical and chemical features required.

[0057] In another version, which is not shown, the conveying means 9 may comprise a number of rollers other than three, in particular two, i.e. a driving roller and an idle roller. Also, the conveying means 9 may comprise a number of rollers equal to four or more in which one is a driving roller and the remaining rollers are idle rollers.

[0058] In still another version, which is not shown in the Figures, the encoder 37 can be mounted coaxially to a supporting shaft of the driving roller 13, or to a respective supporting shaft of the second idle roller 15, and thus not on the supporting shaft of the first idle roller 14. Further, versions and/or additions to what has been disclosed above and/or to what has been shown in the attached drawings are possible.

Claims

1. Edge-banding machine (1), in particular for edge-banding a workpiece (2) made of wood or similar materials, comprising: conveying means (9) for conveying a workpiece (2) along an advancement path (P); a plurality of operating units (101, 102, 103, 104) arranged on said advancement path (P) for applying a laminar element to an edge of said workpiece (2), **characterised in that** said conveying means (9) comprises a conveyor belt (12) closed in a loop and configured for restingly receiving said workpiece (2) in an operating portion (12a) of said conveyor belt (12) and for sliding with said operating portion (12a) in an advancement direction (X) along said advancement path (P).
2. Machine according to claim 1, wherein said conveyor belt (12) comprises a plurality of superimposed layers (16, 19, 20, 21).
3. Machine according to claim 2, wherein said plurality of layers (16, 19, 20, 21) comprises at least a first layer (16) made of elastomer arranged for contact with said workpiece (2).
4. Machine according to claim 2, or 3, wherein said plurality of layers comprises at least a layer (19) made of fabric.

5. Machine according to claim 2, wherein said plurality of layers (16, 19, 20, 21) comprises at least a first layer (16) made of elastomer arranged for contact with said workpiece (2), a second layer (19) made of fabric adjacent to said first layer (16), a third layer (20) made of elastomer adjacent to said second layer, and a fourth layer (21) made of fabric adjacent to said third layer (20). 5
6. Machine according to any preceding claim, and comprising a resting plane (22) arranged below said operating portion (12a) and adjacent to said operating portion (12a) so as to be in a contact relation with said operating portion (12a) at least when said operating portion (12a) restingly receives said workpiece (2). 10 15
7. Machine according to claim 6, wherein said conveyor belt (12) comprises a contact surface (23) with said resting plane (22) made at least partially of fabric. 20
8. Machine according to any preceding claim, and further comprising a lateral containment element (30) extending alongside said conveyor belt (12) for limiting a lateral movement of said conveyor belt (12) along a direction (Y), that is substantially transverse to said advancement direction (X), said lateral containment element (30) operating in contrast with a lateral thrust action of at least one of said operating units (101, 102, 103, 104) on said conveyor belt (12). 25 30
9. Machine according to claim 8, wherein said lateral containment element (30) is arranged below a conveying plane (25) defined by said conveyor belt (12). 35
10. Machine according to claim 8, or 9, wherein said conveyor belt (12) comprises at least a side surface (20a) in contact with said lateral containment element (30) made at least partially of elastomer. 40
11. Machine according to any preceding claim, and comprising pressing means (41) for pressing said workpiece (2) against said conveyor belt (12). 45
12. Machine according to claim 11, wherein said pressing means (41) comprises a plurality of rollers (42) arranged according to said advancement direction (X) for pressing said workpiece (2) against said conveyor belt (12). 50
13. Machine according to any preceding claim, wherein said operating units (101, 102, 103, 104) comprise:
 - a gluing unit (101) for applying an adhesive substance to said laminar element; 55
 - second pressing means (102) operationally arranged after said gluing unit (101) for pressing said laminar element against said edge of said

workpiece (2) so as to fix said laminar element to said workpiece (2);

- at least an operating unit (103) for removing from said laminar element fixed to said edge, material protruding laterally and/or above and/or below said edge;
- optionally, at least a finishing unit (104) for performing surface finishing machinings on said edge.

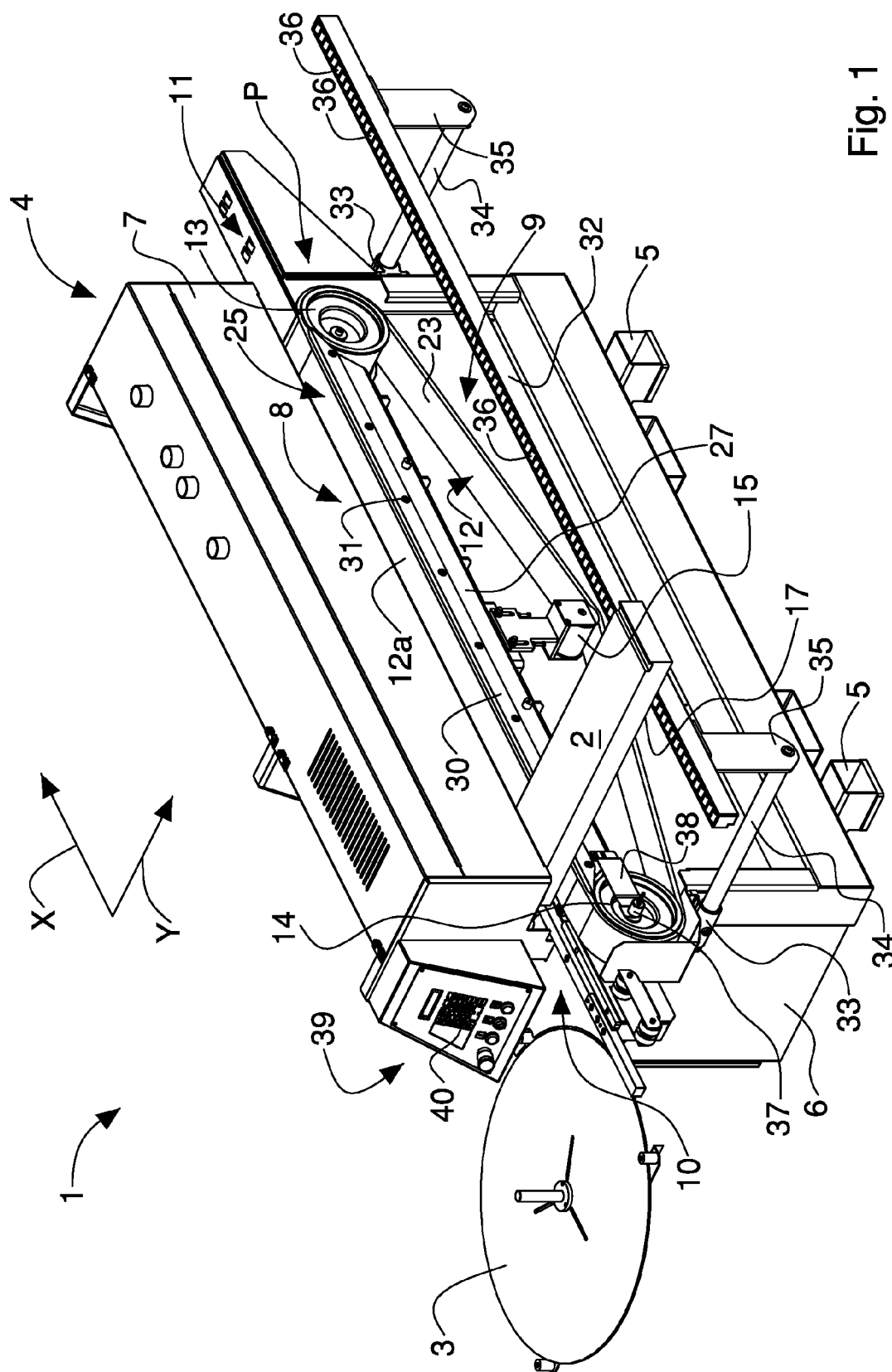


Fig. 1

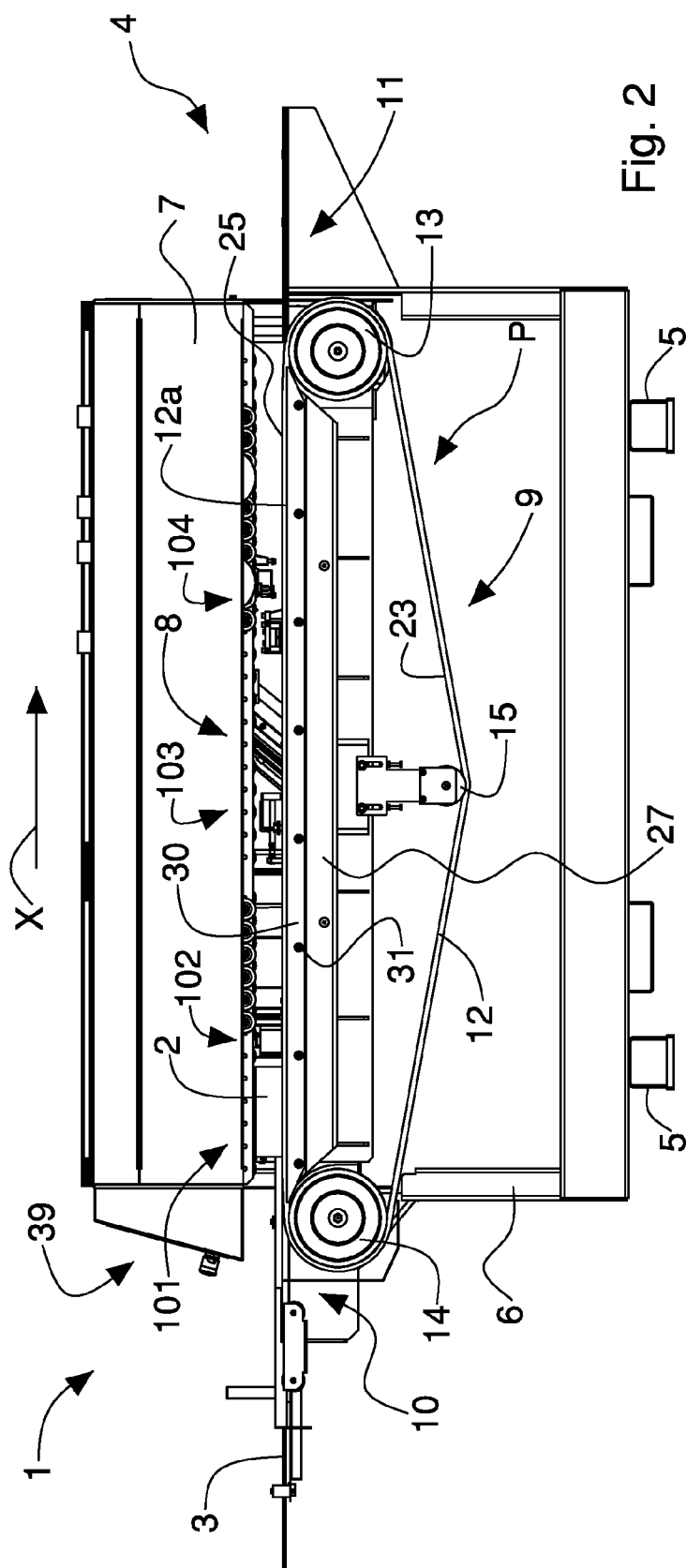


Fig. 2

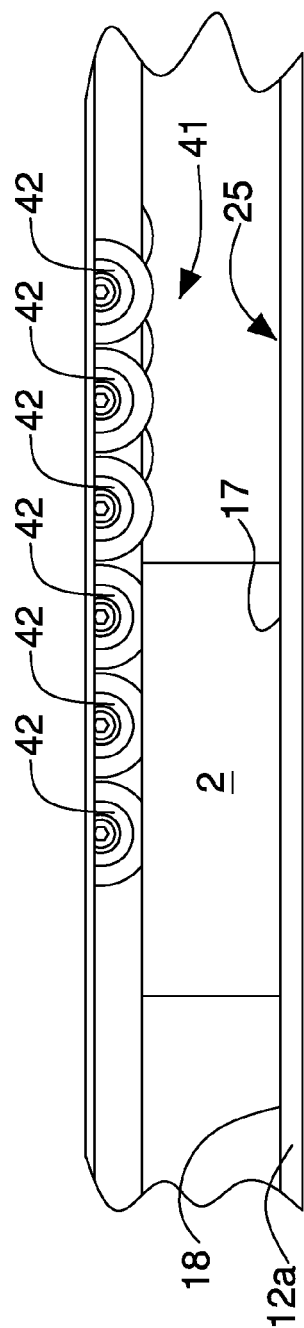


Fig. 2A

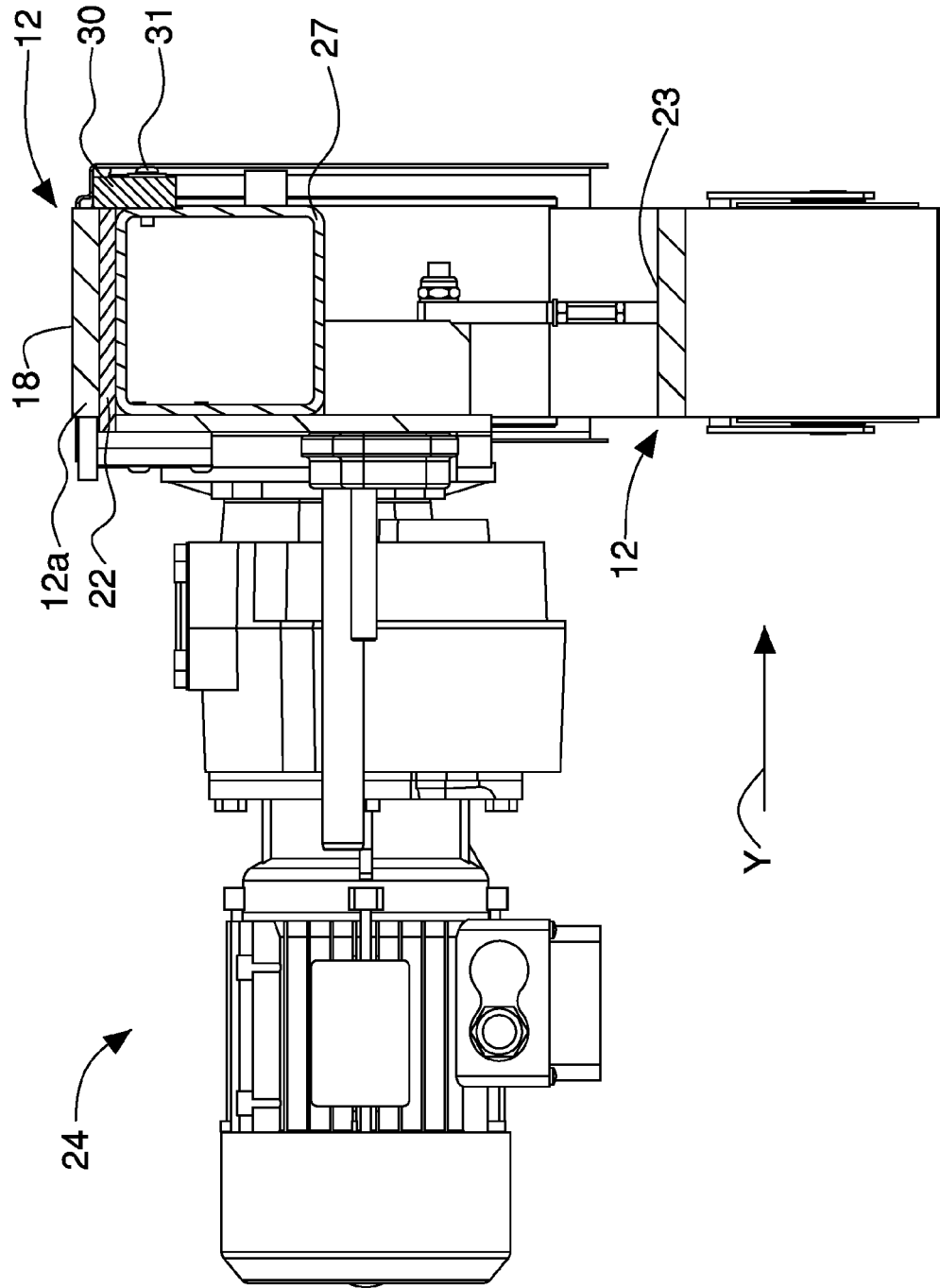


Fig. 3

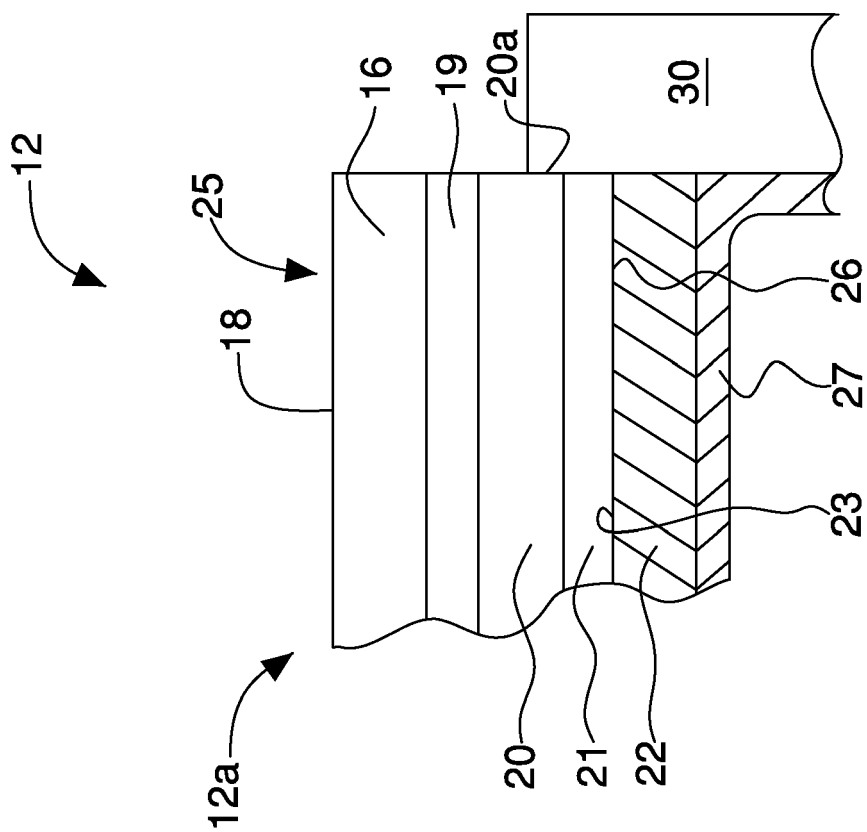


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 10 16 2393

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	EP 0 897 781 A2 (DU PONT [US]) 24 February 1999 (1999-02-24)	1-5,7, 11-13	INV. B27D5/00
Y	* paragraph [0039]; figures 4,5 *	6,8-10	
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		1 July 2010	Huggins, Jonathan
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EPO FORM 1503 03.82 (P04C01)

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

EP 10 16 2393

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01-07-2010

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