(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 699 304 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
14.09.2022 Bulletin 2022/37

(21) Application number: **19158073.7**

(22) Date of filing: **19.02.2019**

(51) International Patent Classification (IPC):
D06H 7/00 *(2006.01)* ***B26D 5/00*** *(2006.01)*
C14B 5/00 *(2006.01)* ***B26D 7/01*** *(2006.01)*
D06H 7/24 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
D06H 7/00; B26D 5/005; B26D 7/018; C14B 5/00; D06H 7/24

(54) APPARATUS FOR AN IMPROVED HOLDING AND CUTTING OF SHEET MATERIAL

VORRICHTUNG ZUM VERBESSERTEN HALTEN UND SCHNEIDEN VON FLÄCHENGEBILDE

APPAREIL DE FIXATION ET DE DÉCOUPE AMÉLIORÉES DE MATÉRIAU EN FEUILLES

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
26.08.2020 Bulletin 2020/35

(73) Proprietor: **Comelz S.p.A.**
27029 Vigevano (PV) (IT)

(72) Inventor: **CORSICO PICCOLINO, Alessandro**
27029 Vigevano (PV) (IT)

(74) Representative: **Botti, Mario et al**
Botti & Ferrari S.p.A.
Via Cappellini, 11
20124 Milano (IT)

(56) References cited:
EP-A1- 0 578 903
US-A- 5 080 297
US-A- 5 975 743
US-B1- 6 624 381

EP 3 699 304 B1

Description

Field of application

[0001] The present invention relates to an apparatus for cutting sheet material, for instance for cutting fabrics for clothing and hide goods, footwear items, automotive and furnishing articles, or non-woven fabrics, leather, synthetic materials and the like, and the following description is made with reference to this application field with the only purpose of simplifying the exposition thereof.

Prior art

[0002] As it is well known in this technical field, there are apparatuses capable of performing the automated cutting of sheet material according to a predefined cutting pattern, the material to be cut being for instance leather/hide, a fabric, a non-woven fabric, a synthetic material and the like.

[0003] In particular, these apparatuses are equipped with a conveyor belt capable of moving the sheet to be cut inside a cutting chamber, which is provided with movable cutting heads for processing the material. Generally, the material to be cut is held on the conveyor belt by suction means arranged below said conveyor belt, so as to ensure the desired holding of the sheet.

[0004] In case of cutting of overlapped material sheets which form a multilayer, known in the field as mattress, often the suction means are not enough to ensure the holding of the material to be cut and the upper layers tend to move during the cutting step, thus often resulting in a not optimal processing. This problem also arises with very breathable materials.

[0005] In order to hold the sheets of material during the cutting step, it is known to cover them with a coating film (for instance cellophane or cartene) having dimensions greater than those of the sheets, in particular such as to adhere to the conveyor belt through the ends thereof. In this way, the coating film, once the suction means have been actuated, creates a sort of vacuum which helps to hold the material.

[0006] The coating film is wound in a roll fixed to the apparatus, this roll being unwound during the movement of the sheet on the conveyor belt.

[0007] US 5,080,297 and EP 0 578 903 disclose apparatuses comprising a coating film roll to coat the sheet to be cut.

[0008] However, in the known configurations, it is not easy to arrange the film on the sheets to be cut and the unwinding of the roll during the movement of the conveyor belt is often problematic, resulting in a non-optimal arrangement of the film and/or in a tear thereof. Moreover, the film roll creates an annoying obstruction for the operator. There is therefore the need for a more effective holding system, especially for cutting overlapped sheets of material.

[0009] The technical problem of the present invention is to provide an apparatus for cutting sheet material having structural and functional features so as to allow overcoming the above-mentioned limitations and drawbacks which still affect the known solutions, thus optimizing the sheet processing, thus optimizing the feeding and processing of the sheet into the apparatus.

Summary of the invention

[0010] The solution idea underlying the present invention is to associate a coating film roll for sheets to be cut with a movable support, which is capable of sliding in a direction parallel to that in which the sheet to be cut in the apparatus is moved. For instance, the roll may be associated with feeding means for feeding said sheets into the apparatus, said feeding means comprising a movable feeding plane with which the roll moves integrally. In this way, it is possible to cover the sheets of material in an automated manner during a movement of the support, said movement being opposite to that of the sheet on the belt (for instance while the movable plane draws back during the feeding step), thus facilitating the unwinding of the roll. A suitable movement system allows reducing the overall dimensions of the roll.

[0011] Based on said solution idea, the above technical problem is solved by an apparatus for cutting at least one sheet of material according to claim 1 comprising a cutting area, conveying means adapted to feed the sheet into the cutting area along a forward direction, a coating film roll adapted to coat and hold the sheet on the conveying means, and a support for said coating film roll, characterized in that said support is configured to move with respect to the conveying means in a direction that is parallel to the forward direction.

[0012] More particularly, the invention comprises the following additional characteristics, taken individually or in combination if required.

[0013] According to the present invention, the coating film roll is associated with the support so as to be unwound and to coat a surface of the sheet when said support moves in a direction that is opposite the forward direction of the sheet.

[0014] According to the present invention, the apparatus comprises feeding means adapted to feed the sheet on the conveying means, said feeding means comprising a movable plane adapted to support the sheet and configured to move towards and away from said conveying means, the support of the coating film roll being connected with said feeding means. In this way, the roll is unwound while the movable plane moves away from the conveying means.

[0015] According to another aspect of the present invention, the feeding means for feeding the sheet may comprise a holding element that is configured to hold the sheet during the movement of the movable plane.

[0016] More particularly, the holding element may comprise a crosspiece which is above the movable plane

and is equipped with pressers that are configured to exert a pressure onto the movable plane.

[0017] According to another aspect of the present invention, the coating film roll may be connected to the holding element of the feeding means and may be configured to move integrally thereto.

[0018] Alternatively, the coating film roll may be connected to the movable plane and may be configured to move integrally with it.

[0019] According to another aspect of the present invention, the feeding means may comprise a motor that is configured to move worm screws, as well as a pair of sliding blocks which the movable plane is connected to, the rotation of the worm screws causing a sliding movement of said sliding blocks in a direction which is parallel to the forward direction.

[0020] According to another aspect of the present invention, the movable plane may be sliding between a retracted position, in which it is spaced from the conveying means, and a feeding position, in which it is partially overlapped to, and is above, said conveying means.

[0021] Furthermore, the feeding means may comprise a support structure that is rotatably fastened to the apparatus, forming folding feeding means.

[0022] According to aspect of the present invention, the support structure may be configured to drive the movable plane from a first rest position, in which it is vertically extended close to a lower portion of the apparatus, to a second operating position, in which it is horizontally extended, in a manner substantially parallel to the conveying means.

[0023] According to another aspect of the present invention, the apparatus may comprise movement means adapted to move the coating film roll away from and towards a plane whereon the sheet lies, in response to a control signal. More particularly, said movement means may comprise pistons which are configured to move the roll at least in a direction which is substantially orthogonal to the forward direction.

[0024] According to another aspect of the present invention, the coating film may be made of cellophane.

[0025] According to another aspect of the present invention, the apparatus may comprise further cutting means which are configured to separate a portion of the coating film, arranged on the sheet, from the coating film roll.

[0026] According to another aspect of the present invention, the apparatus may also comprise a control unit configured to control said apparatus, said control unit being configured to move the movable plane in an automated manner.

[0027] Still according to another aspect of the present invention, the conveying means may comprise a conveyor belt which crosses the cutting area.

[0028] According to another aspect of the present invention, the apparatus may further comprise suction means which are adapted to suck air at the surface of the conveyor belt for holding the sheet and the coating film on said surface.

[0029] Finally, it is noted that the material to be cut may comprise a plurality of sheets stacked on top of each other.

[0030] The features and advantages of the apparatus according to the invention will become apparent from the following description of an embodiment thereof, given by way of non-limiting example with reference to the accompanying drawings.

Brief description of the drawings

[0031] In those drawings:

- figure 1 shows a sectional view of a cutting chamber of an apparatus according to the present invention; and
- figures 2A-2C show a perspective view of the apparatus of the present invention in different operating configurations.

Detailed description

[0032] With reference to those figures, an apparatus according to the present invention is globally and schematically indicated with the reference number 1.

[0033] It is worth noting that the figures represent schematic views and are not drawn to scale, but instead they are drawn so as to emphasize the important features of the invention. Moreover, in the figures, the different elements are depicted in a schematic manner, their shape varying depending on the application desired. It is also noted that in the figures the same reference numbers refer to elements that are identical in shape or function. Finally, particular features described in relation to an embodiment illustrated in a figure are also applicable to the other embodiments illustrated in the other figures.

[0034] In its most general form, the apparatus 1 is adapted to process, and in particular is adapted to automatically cut, folding or flexible sheets 2 of material, for instance fabrics for clothing and hide goods, footwear items, automotive and furnishing articles, or non-woven fabrics, leather, synthetic materials and the like.

[0035] In the context of the present invention, the term "sheet" indicates any element of any shape and material, having a substantially two-dimensional size and a certain thickness (generally reduced), which is to be cut through the apparatus 1. As it will be noticed hereinafter in greater detail, often the cutting of a plurality of sheets stacked on top of each other is performed.

[0036] The apparatus 1 is a numerical control machine equipped with data and program memories. In particular, the apparatus 1 comprises a control unit including said memories and suitably programmed and responsible for the management and automatic control thereof. The control unit may be for instance an integrated computerized unit or may be external to the apparatus 1 and operatively

connected thereto. Furthermore, the control unit may be a unique central unit or may comprise a plurality of local units.

[0037] In general, as shown in figure 1, the apparatus 1 of the present invention comprises a frame F, made for example of a metallic material, which supports and encloses its main components.

[0038] More particularly, the apparatus 1 comprises a cutting area 3 inside which the sheet 2 processing takes place. The cutting area 3 has an inlet 4 through which the sheet 2 is fed and an outlet 5 from which the cut portions of said sheet 2 are recovered.

[0039] Furthermore, the apparatus 1 comprises a conveyor belt 6 which crosses the cutting area 3 from the inlet 4 to the outlet 5 and is adapted to feed the sheet 2 into said cutting area 3. The conveyor belt 6 is covered by a sacrificial and breathable support layer (not shown in the figures) which is subjected to multiple cutting steps during various processing and which is periodically replaced. Below the support layer, conventional suction means are provided (also not illustrated in the figures), which allow holding the sheet 2 in place on the conveyor belt 6 during the forward movement.

[0040] In an embodiment, the cutting area 3 is a closed chamber on at least the two sides which are parallel to the movement direction of the conveyor belt 6, and it will be hereinafter also indicated as cutting chamber 3.

[0041] The forward direction of the sheet 2 on the conveyor belt 6 towards the cutting chamber 3 is herein indicated as direction Y, said forward movement occurring in particular in the direction indicated by the arrow A.

[0042] As previously mentioned, the inlet 4 gives access to the cutting chamber 3 which is crossed by the conveyor belt 6, said cutting chamber 3 being equipped on top thereof with a plurality of image detectors 7 intended to take images of the sheet 2 to be cut.

[0043] Specifically, the image detectors 7 are cameras or video cameras configured to capture high resolution images of the surface of the sheet 2.

[0044] The image detectors 7 may be arranged upstream of the cutting chamber 3, so as not to interfere with the sheet 2 cutting operation, or may be arranged inside the cutting chamber 3, or may be arranged both upstream of and outside said cutting chamber 3. In the latter case, a very versatile apparatus 1 is obtained, which allows a large number of applications, including those applications requiring a very precise cut.

[0045] In particular, the use of image detectors 7 upstream of the cutting chamber 3 allows easily performing the acquisition of images even during the cutting step, since it is possible to use a support structure for said image detectors 7 which does not interfere with the tools in the cutting chamber 3. However, the movement of the sheet 2 on the conveyor belt 6 may introduce unacceptable errors, and thus in some applications it is desirable to integrate the image detectors 7 even in the cutting chamber 3, in particular in the upper part thereof.

[0046] The image detectors 7 may be arranged as a grid or matrix, to cover for instance a rectangular surface which ranges and substantially corresponds to the perimeter dimension of the cutting chamber 3, in other words, to the section of conveyor belt 6 contained inside the cutting chamber 3. Obviously, other arrangements of the image detectors 7 are provided by the present invention; for instance, the image detectors 2 may be arranged on a line and supported by a crosspiece in order to cover a surface which ranges and corresponds at least to the transverse dimension of the sheet 2.

[0047] Suitably according to the present invention, the apparatus 1 comprises a crosspiece inside the cutting chamber 3, said crosspiece being above the conveyor belt 6 and extending between the two sides thereof which are opposite with respect to the movement direction Y. As it will be illustrated hereinafter, this crosspiece supports one or more movable carriages, which allow moving cutting heads adapted to cut the sheet 2. As illustrated in figure 1, the image detectors 7 are connected to this crosspiece (which can be suitably perforated for this purpose), allowing an extremely precise acquisition even inside the cutting chamber 3.

[0048] In general, the resulting image of the sheet 2 is given by the overlap of the images acquired by the image detectors 7 outside the cutting area 3 and by those integrated therein. It is thus apparent that the apparatus 1 of the present invention allows performing any kind of application, both those requiring high cutting speeds, and those requiring a high precision, as well as it is able to cut single leathers/hides, multilayer materials, as well as to perform cuts such as the so-called trimming of already cut portions, and the like.

[0049] The image detectors 7 are video cameras or cameras of the digital type, for instance CCD, and incorporate therein a processor that transforms and immediately makes an image data file available in a format processable by the control unit, for instance a JPEG format or the like.

[0050] Obviously, the skilled person understands that a different number or arrangement of the image detectors 7 may be provided, as well as, if necessary, that they may not be introduced.

[0051] The apparatus 1 further comprises cutting means 8 for cutting the sheet 2, said cutting means 8 not being limited to a particular type. By way of example, the cutting may occur through a blade, laser, water jet, milling machine, or any other suitable manner, preferably through a blade.

[0052] In particular, the cutting means 8 comprise cutting heads 8' which are movable inside the cutting chamber 3 and specifically arranged to cut the sheet 2. According to a preferred embodiment of the present invention, the apparatus 1 comprises two cutting heads 8', even if the present invention is not limited thereto, and the number of the cutting heads may vary according to the needs and/or circumstances.

[0053] Generally, the cutting heads are mounted on carriages 8" supported by suitable support structures,

these carriages being movable along preset sliding axes, said carriages 8" being thus able to move the cutting heads 8' inside the cutting chamber 3. More particularly, a carriage 8" is mounted on at least two guides which allow the sliding thereof along the particular sliding axis.

[0054] Furthermore, according to an embodiment of the present invention, the inlet 4 and/or the outlet 5 of the cutting chamber 3 comprises a closure element 10, which may be for example a glass or plexiglass plate or screen connected to the frame F of the apparatus 1, or equipped with its own frame which is in turn connected to the frame F.

[0055] The closure element 10 arranged at the inlet 4 is movable between a first position or open position, in which the access to the cutting chamber 3 from the inlet 4 is allowed, and a second position or closed position (end-stroke position), in which the access to the cutting chamber 3 is not allowed.

[0056] In a preferred embodiment of the present invention, in the closed position the closure element abuts onto the surface of the sheet 2, thus exerting a certain pressure thereonto. Still more preferably, the closure element 10 is square or rectangular-shaped and abuts onto the surface of the sheet 2 through its lower side. In this way, it is possible to suitably hold the sheet 2 during the cutting step, as well as to reduce the noise caused by the cutting means.

[0057] Suitably, the closure element 10 is configured to be automatically kept in the open position when the cutting means 8 are not actuated, and thus when the processing of the sheet 2 does not occur. In this way, the closure element 10 remains raised if the apparatus 1 is off or stopped, as well as it automatically raises once the cutting of the sheet 2 is finished and thus once the cutting means 8 are stopped.

[0058] The closure element 10 is further configured to be automatically kept in the closed position during the actuation of the cutting means 8, and thus during the processing of the sheet 2. In this way, the closure element 10 automatically lowers as soon as the cutting means are operated.

[0059] The above automatic opening and closing operations of the closure element 10 according to the operating condition of the cutting means 8 are managed by the above control unit C, which is operatively connected both with the cutting means 8 and with the movement means of said closure element 10. In particular, the apparatus 1 comprises suitable movement means (for instance an electric motor, not illustrated in the figures) which are adapted to move the closure element 10 in an automated manner. The movement means are connected to the control unit for the automatic control of the movement of the closure element as above illustrated.

[0060] The movement of the closure element 10 occurs in a direction that is substantially orthogonal to the forward direction Y, even if other configurations are possible and fall within the scope of the present invention.

[0061] Obviously, the closure element 10 provided in the apparatus 1 could also not be present, and the present invention is not limited to the presence of said closure element.

[0062] Now with reference to figures 2A-2C, advantageously according to the present invention, in order to suitably feed and position the sheet 2 on the conveyor belt 6, the apparatus 1 comprises feeding means 13 for feeding said sheet 2.

[0063] In particular, the feeding means 13 for feeding the sheet 2 are equipped with a movable element or plane 14, which is supported by a suitable support structure F' that is connected to the apparatus 1. The movable plane 14 is substantially a plate-like support on whose surface the sheet 2 to be loaded on the conveyor belt 6 is arranged.

[0064] The movable plane 14 is configured to suitably feed the sheet 2 on the conveyor belt 6, said movable plane 14 sliding towards and away from the conveyor belt 6.

[0065] Still more particularly, the movable plane 14 moves in a direction that is substantially parallel to the forward direction of the sheet 2 on the conveyor belt 6 (i.e. the direction Y) and is in particular movable between a first position or retracted position, in which it is spaced apart from the apparatus 1 (for instance a gap between the conveyor belt 6 and the movable plane 14 may be present, as illustrated in figure 2A), and a second position or feeding position, in which it is partially overlapped to (it is above) the conveyor belt 6, as illustrated in figure 2B.

[0066] When it is in the feeding position, a portion of the movable plane 14 is thus able to overlap to the conveyor belt 6, for instance by a section of about 40 cm, so as to correctly feed the sheet 2 on said conveyor belt 6.

[0067] Furthermore, during the sliding movement of the movable plane 14, the material to be cut is held by at least one holding element 15 of the feeding means 13.

[0068] In an embodiment, the holding element 15 comprises a crosspiece (still indicated with the reference number 15) which is above the movable plane 14 and is apt to move along an axis that is substantially orthogonal to the sliding direction of said movable plane 14. The crosspiece 15 is thus capable of raising and lowering, abutting against the material arranged on said movable plane 14. When it abuts against the material, the crosspiece 15 exerts a pressure, performing in this way the desired holding of the material during the movement of the movable plane 14, i.e. during the feeding step.

[0069] Alternatively, in a preferred embodiment, the crosspiece does not move along the vertical axis and comprises a plurality of pressers, for instance housed in holes made in the crosspiece. The pressers may be for instance pistons configured to abut onto the surface S of the sheet 2 in order to hold the material on the movable plane 14 when required. The number of pressers may vary according to the needs and/or circumstances, for instance, in an embodiment, five equally spaced pistons are arranged on the crosspiece.

[0070] According to a further alternative embodiment,

the crosspiece is rotatably coupled to a support (which is in turn connected to the support structure F') and is adapted to press the material by tilting (i.e. by performing a partial rotational movement), for instance further to a thrust exerted by a piston which moves the crosspiece from a rest position to a pressure tilted position. More particularly, in this embodiment, the crosspiece clamps the material through a lower portion thereof (which may be for instance in the shape of a rod equipped with rubberized gasket to avoid damaging the material) further to the activation through the piston.

[0071] Obviously, it is also possible to think of a combination of the holding elements above described.

[0072] Furthermore, the feeding means 13 comprise a motor 16 that is configured to move worm screws, which are responsible for the movement of the movable plane 14. More particularly, through a system of screws and gears, a pair of worm screws 16' (or the respective nuts), which a pair of sliding blocks is connected to, is moved. The movable plane 14 is thus connected to the pair of sliding blocks and the rotation of the worm screws 16' causes the movement of said sliding blocks (and thus of the movable plane itself).

[0073] Furthermore, in an embodiment, the crosspiece 15 may not be integral with the movable plane 14 and thus may be idle, said crosspiece 15 being moved by the movement of the movable plane 14 when it holds the material to be cut. In other words, in this embodiment, the crosspiece is fastened to the movable plane 14 just through the pressure exerted on said plane, for instance through the above-mentioned pistons. The idle crosspiece 15 may be connected to the movable plane also through suitable connection elements (such as for instance suitably arranged pistons). In this embodiment, the crosspiece 15 is thus not motorized and is hand-moved by the operator, said crosspiece being connected to sliding blocks which are sliding in the support structure F'; the operator pushes the crosspiece 15 towards the conveyor belt 6 to place a new sheet onto the movable plane 14; afterwards it is brought to the initial position and can be fastened to the movable plane with two side pistons. When the pistons are activated, the movable plane 14 and the crosspiece 15 are thus integral with each other.

[0074] Thanks to the presence of the feeding means 13, the sheet 2 may be positioned on the conveyor belt 6 in a simple and effective manner. In fact, the movable plane 14 is substantially cantilever supported outside the apparatus 1 and makes it easy for the operator to prepare the new sheet to be loaded. Moreover, it also facilitates the alignment of the various layers of sheets 2 with each other and their alignment with respect to the movement of the conveyor belt 6. The holding element 15 further allows effectively holding the sheet 2 during the feeding step.

[0075] Once the movable plane 14 is overlapped to the conveyor belt 6 in the feeding position, the crosspiece 15 (or the pistons associated therewith) raises, thus eliminating the pressure exerted onto the movable plane 14.

[0076] In an embodiment of the present invention, the closure element 10 cooperates with the feeding means 13, holding the sheet 2 while the movable plane 14 draws back. In other words, as soon as the closure element 10 presses onto the sheet 2, the pressure of the holding element 15 is released and the movable plane 14 draws back, the sheet 2 being in fact suitably held by said closure element 10, so that it is suitably loaded on the conveyor belt. In other words, the closure element 10 also acts as a fixed holding element.

[0077] Suitably, in an embodiment, the movable plane 14 has indentations 21 at the end thereof which faces towards the conveyor belt 6, to allow a better holding of the fed sheet. Therefore, the closure element 10 comprises, at the portion thereof facing the sheet 2 (i.e. the side abutting onto the sheet 2), projections corresponding to the indentations 21 of the movable plane 14, so as to press the material onto the conveyor belt 6 without pressing onto the movable plane 14, which can thus draw back without any problem.

[0078] Alternatively, the holding of the sheet 2 may not be performed by the closure element 10 but by a further holding element, which is fixed to the frame of the apparatus 1 and may also be equipped with suitable pistons for holding the material, wherein said pistons may be arranged at the indentations 21.

[0079] However, it is noted that the particular holding mode of the sheet 2 may vary according to the needs and/or circumstances and is not an object of the present invention.

[0080] Suitably, the above movements of the holding element 15 may occur in a completely automated manner and managed by the central unit.

[0081] Guides which facilitate the alignment of the sheet 2 are also provided along the movable plane 14.

[0082] Generally, in order to entirely cut the sheet 2, the conveyor belt 6 is moved more than once (for instance, for synthetic materials, there may be sheets that are even 50 m long). As a result, in case of particularly long sheets 2, even the movable plane 14 is made to slide several times away from and towards the conveyor belt 6.

[0083] Suitably, the movement of the movable plane 14 is controlled in an automated manner by the central unit and, in an embodiment, it is synchronized with that of the conveyor belt 6.

[0084] The intervention of the closure element 10 (or of further fixed holding means) as a holding presser for the material is particularly useful when the frontal part of a new sheet is inserted. In the successive movements of the conveyor belt 6, the sheet 2 is very much overlapped to the conveyor belt 6 and therefore the usefulness of the movable plane 14 and of the fixed holding element is less.

[0085] As above anticipated, when a sheet 2 has been loaded on the conveyor belt 6, the movable plane 14 moves away from the conveyor belt 6 leaving a gap,

where the remaining portion of the loaded sheet may be dropped. As a result, in order to have a free portion of the movable plane 14, it is not necessary to wait for the processing of the previous sheet to be ended, thus optimizing the entire process.

[0086] Suitably, the support structure F' of the movable plane 14 is rotatably coupled to the apparatus 1 (for instance it is hinged thereto), so as to form foldable feeding means 13. Specifically, the support structure F' is adapted to rotate between a first position, in which the movable plane 14 is substantially parallel to the conveyor belt 6 (i.e. a position in which the movable plane may slide towards the conveyor belt 6 in a direction parallel to the direction Y, as illustrated in figures 2A and 2B), and a second position, in which the movable plane is folded in an arrangement that is substantially orthogonal to the conveyor belt 6 and does not represent an obstruction for the operator (as illustrated in figure 2C, in which the movable plane is in a lowered position).

[0087] In other words, in addition to a translation movement, the movable plane 14 also performs a rotation movement and is capable of being folded away.

[0088] The movable plane 14 is thus movably guided on guides G of the support structure F' from a rest position, in which it is vertically extended close to a lower front portion 20 of the frame F of the apparatus, to an operating position in which it is horizontally extended, according to the reference of the figures. Support motorized means for the movable plane are provided to actuate the movable plane 14 between the two indicated positions. The above described foldable system allows reducing the overall dimensions of the movable plane 14, at the same time keeping it fastened to the apparatus 1, thus resulting in an effective and compact system. In fact, when the movable plane 14 is in the folded position, the crosspiece 15 as well is in the folded position and does not entail any obstruction for the operator. This is particularly useful since, for some materials, the use of the movable plane 14 may not be needed, thus obtaining a particularly versatile machine.

[0089] Furthermore, the rotating movement of the support structure F' of the feeding means 13 may be automatic or manual.

[0090] Still more advantageously, in order to ensure the correct holding of the sheets 2 during the cut thereof, the apparatus 1 comprises means for applying a coating film 17 adapted to coat the sheet 2 of material to be cut on the conveyor belt 6.

[0091] By way of example, the coating film 17 may be a film of cellophane, or a film made of plastic materials like cartene, or in general any film adapted to cover sheets of material to be cut.

[0092] It is further noted that, in the context of the present invention, the term "film" indicates any sheet or thin layer of plastic material adapted to coat a sheet of material to be cut, as known in the art.

[0093] In particular, the coating film 17 is wound so as to form a roll (still indicated herein with reference number 17). The reference number 17 thus indicates both a portion of coating film arranged on the sheet 2 and the coating film roll still to be applied.

[0094] According to the present invention, the coating film roll 17 is supported by a support, which is associated (connected) with the feeding means 13. The support of the roll may include a tubular element around which the roll is arranged.

[0095] In particular, the coating film roll 17 is connected to the holding element 15 of the feeding means 13 (for instance connected to the same support with which the crosspiece is connected to the support structure F') and is configured to move integrally thereto.

[0096] Alternatively, the coating film roll 17 is directly connected to the movable plane 14, for instance connected to the sliding blocks, i.e. the sliding blocks which cause the movement of the movable plane 14, and is configured to move integrally thereto, and thus the support thereof is not connected to the holding element 15.

[0097] However, it is noted that the particular connection mode of the roll may vary according to the needs and/or circumstances.

[0098] Suitably, the coating film roll 17 is associated with the feeding means 13 in such a way that the unwinding thereof occurs when the movable plane 14 moves away from the conveyor belt 6. In this way, while the movable plane 14 (and thus the coating film roll 17) moves away from the conveyor belt 6, said roll is unwound and coats at least one portion of the surface S of the sheet 2 of material to be cut.

[0099] In other words, the unwinding direction of the roll 17 is opposite the forward direction of the sheet 2 on the conveyor belt 6.

[0100] Compared to the known solutions, the roll is not fixed but it is movable and unwinds in an opposite direction. When the movable plane 14 (and thus the sheet 2 of material arranged thereon) moves forward, the roll 17 is fixed with respect to the movable plane 14 and moves forward therewith without unwinding. When the movable plane 14 draws back, the roll 17, lying on the sheet 2, unwinds without being pulled, causing a particularly easy coating of the sheet 2. The weight of the roll itself and the suction of the suction means below the conveyor belt further facilitate the application of the coating film.

[0101] This is particularly advantageous, especially at the beginning of the loading of a new sheet 2, further preventing the coating film 17 from moving during the movement of the conveyor belt 6.

[0102] According to an embodiment of the present invention, the apparatus 1 further comprises movement means adapted to move the coating film roll 17 away from and towards the surface S of the sheet 2, in particular with respect to a plane α whereon the sheet 2 lies. More particularly, said movement means are configured to move the coating film roll 17 from a first position, in which it is spaced from the surface of the sheet 2 (for instance by some centimeters), to a second position, in which it abuts on the surface S of the sheet 2 and is ready to coat

said sheet, said movement occurring in particular in a direction that is substantially orthogonal to the movable plane 14. The movement means contribute in limiting the overall obstruction of the roll.

[0103] In a preferred embodiment of the present invention, the movement means of the roll comprise pistons which are configured to automatically move the roll 17 in response to a control signal. For example, if it is not desired to cover the sheet 2 with the coating film 17, it is possible to raise the roll through the pistons, for instance further to pressing a button (not illustrated in the figures) or further to selecting a particular function through a user interface (also not illustrated); further to the operator's command, the central unit is configured to send the suitable control signal to the pistons.

[0104] Suitably, the coating film roll 17 is arranged on the feeding means 13, which, as above illustrated, are folding means that, upon request, may disappear. In this way, if necessary, it is possible to remove the roll, which is bulky and very heavy, from the working area (for instance in case of cutting single sheets which do not need to be held).

[0105] Furthermore, the apparatus 1 comprises further cutting means (not illustrated in the figures) which are configured to separate a portion of the coating film 17, already disposed on the sheet 2, from the coating film roll 17 still to be applied. For instance, said further cutting means may be arranged on the holding element 15 and may comprise a movable cutter suitably moved (for instance moved parallel to the holding means 15) in order to trim the coating film. In this case, the plane 14 may comprise a Teflon film for protective purposes.

[0106] Finally, in an embodiment of the present invention, not illustrated in the figures, the feeding means 13 are not present and the holding of the sheet 2 occurs for instance through a crosspiece which is above the conveyor belt 6 and is capable of sliding relatively to said conveyor belt in a direction that is substantially parallel to the forward movement. In this case, the support of the coating film roll 17 is associated with the movable crosspiece and is configured to move therewith. The unwinding of the roll thus occurs when the crosspiece moves in a direction opposite the forward direction, analogously to what occurs while the movable plane 14 moves away from the conveyor belt 6, as described above.

[0107] In conclusion, the present invention provides for associating a coating film roll for sheets to be cut with a movable support, which is capable of sliding in a direction parallel to that in which the sheet to be cut in the apparatus is moved. For instance, the roll may be associated with feeding means for feeding said sheets into the apparatus, said feeding means comprising a movable feeding plane with which the roll moves integrally. In this way, it is possible to cover the sheets of material in an automated manner during a movement of the support, said movement being opposite to that of the sheet on the belt (for instance while the movable plane draws back during the feeding step), thus facilitating the unwinding of the roll. A suitable movement system allows reducing the overall dimensions of the roll.

[0108] Advantageously according to the present invention, the coating film ensures that the material to be cut is held during the cutting step, which is particularly useful in case of multilayered materials in which the upper layers tend to move, or in case of particularly breathable materials.

[0109] Still more advantageously, the apparatus of the present invention allows a particularly effective application of the coating film, the unwinding of the roll being facilitated by the particular configuration adopted.

[0110] In this way, the coating film is arranged onto the sheet of material without being pulled (the roll is in fact configured so as to be unwound smoothly without friction and without being pulled while the support draws back, for instance while the movable plane draws back). The movement of the roll is independent from the movement of the conveyor belt and of the sheet lying thereon, thus facilitating and optimizing the use thereof; moreover, it is not necessary to arrange the film onto the sheet by the operator, since the movement of the belt automatically implies the unwinding of the roll.

[0111] This is very advantageous compared to the known configurations, wherein the film roll is mounted on a tube that is not able to make any movement other than a rotary movement about its longitudinal axis, said tube crossing the core of the roll. In particular, in the known solutions, the operator unwinds the first few meters of film by hand and covers the material (this operation requires time since the film is very thin, flutters and creates folds when it is placed); afterwards, when the belt moves forward, the film is unwound only due to the friction it has on the material and thanks to the suction in a limited space below the film and outside the material to be cut, which may cause a displacement of the film or may create folds.

[0112] It is therefore undeniable that the present invention suitably solves the technical problem and has significant advantages compared to the prior art.

[0113] Finally, the possibility of arranging the roll on the folding feeding means and the presence of the lifting pistons makes the apparatus of the present invention very versatile.

[0114] Obviously, a person skilled in the art, in order to meet particular needs and specifications, can carry out several changes and modifications to the apparatus described above, all included in the protection scope of the invention as defined by the following claims.

Claims

1. Apparatus (1) for cutting at least one sheet (2) of material, comprising:

    - a cutting area (3);
    - conveying means (6) adapted to feed the sheet

(2) into said cutting area (3) along a forward direction (Y);
- a coating film roll (17) adapted to coat and hold the sheet (2) on said conveying means (6); and
- a support for said coating film roll (17), said support being configured to move with respect to the conveying means (6) in a direction which is parallel to the forward direction (Y),

characterized in that it comprises feeding means (13) adapted to feed the sheet (2) on the conveying means (6), said feeding means (13) comprising a movable plane (14) that is configured to move towards and away from said conveying means (6), wherein the support of the coating film roll (17) is connected to said feeding means (13).

2. Apparatus (1) according to claim 1, wherein the coating film roll (17) is associated with the support so as to be unwound and to coat a surface (S) of the sheet (2) when said support moves in a direction that is opposite said forward direction (Y) of the sheet (2).

3. Apparatus (1) according to claim 1 or 2, wherein the feeding means (13) for feeding the sheet (2) comprise at least one holding element (15) that is configured to hold the sheet (2) during the movement of the movable plane (14).

4. Apparatus (1) according to claim 3, wherein the holding element (15) comprises a crosspiece which is above the movable plane (14) and is equipped with pressers that are configured to exert a pressure onto said movable plane (14).

5. Apparatus (1) according to claim 3 or 4, wherein the coating film roll (17) is connected to the holding element (15) of the feeding means (13) and is configured to move integrally thereto.

6. Apparatus (1) according to claim 1 or 2, wherein the coating film roll (17) is connected to the movable plane (14) and is configured to move integrally thereto.

7. Apparatus (1) according to any one of the previous claims, wherein said feeding means (13) comprise a motor (16) that is configured to move worm screws (16'), as well as a pair of sliding blocks which said movable plane (14) is connected to, the rotation of the worm screws (16') causing a sliding movement of said sliding blocks in a direction parallel to said direction (Y).

8. Apparatus (1) according to any one of the previous claims, wherein said movable plane (14) is sliding between a retracted position, in which it is spaced from the conveying means (6), and a feeding position, in which it is partially overlapped to said conveying means (6).

9. Apparatus (1) according to any one of the previous claims, wherein said feeding means (13) comprise a support structure (F') that is rotatably fastened to said apparatus (1) forming folding feeding means.

10. Apparatus (1) according to claim 9, wherein the support structure (F') is configured to drive the movable plane (14) from a first rest position, in which it is vertically extended close to a lower portion (20) of said apparatus (1), to a second operating position in which it is horizontally extended, substantially parallel to the conveying means (6).

11. Apparatus (1) according to any one of the previous claims, comprising movement means adapted to move the coating film roll (17) away from and towards a plane (α) in which the sheet (2) lies.

12. Apparatus (1) according to any one of the previous claims, wherein said coating film (17) is made of cellophane.

13. Apparatus (1) according to any one of the previous claims, comprising further cutting means that are configured to separate a portion of the coating film arranged on the sheet (2) from the coating film roll.

14. Apparatus (1) according to any one of the previous claims, wherein said conveying means (6) comprise a conveyor belt which crosses said cutting area (3), said apparatus further comprising suction means that are adapted to suck air at the surface of the conveyor belt for holding the sheet (2) and the coating film (17) on said surface.

Patentansprüche

1. Vorrichtung (1) zum Schneiden mindestens einer Bahn (2) eines Materials, umfassend:

- einen Schneidebereich (3);
- Fördermittel (6), die ausgelegt sind, um die Bahn (2) entlang einer Vorwärtsrichtung (Y) in den Schneidebereich (3) einzuführen;
- eine Beschichtungsfilmwalze (17), die ausgelegt ist, um die Bahn (2) zu beschichten und auf den Fördermitteln (6) zu halten; und
- einen Träger für die Beschichtungsfilmwalze (17), wobei der Träger eingerichtet ist, um sich in Bezug auf die Fördermittel (6) in einer Richtung zu bewegen, die parallel zu der Vorwärtsrichtung (Y) ist,

dadurch gekennzeichnet, dass sie Zuführmittel

(13) umfasst, die ausgelegt sind, um die Bahn (2) auf den Fördermitteln (6) zuzuführen, wobei die Zuführmittel (13) eine bewegbare Ebene (14) umfassen, die eingerichtet ist, um sich hin zu und weg von den Fördermitteln (6) zu bewegen, wobei der Träger der Beschichtungsfilmwalze (17) mit den Zuführmitteln (13) verbunden ist.

2. Vorrichtung (1) nach Anspruch 1, wobei die Beschichtungsfilmwalze (17) dem Träger zugeordnet ist, um abgewickelt zu werden und um eine Fläche (S) der Bahn (2) zu beschichten, wenn sich der Träger in einer Richtung bewegt, die entgegengesetzt zu der Vorwärtsrichtung (Y) der Bahn (2) ist.

3. Vorrichtung (1) nach Anspruch 1 oder 2, wobei die Zuführmittel (13) zum Zuführen der Bahn (2) mindestens ein Halteelement (15) umfassen, das eingerichtet ist, um die Bahn (2) während der Bewegung der bewegbaren Ebene (14) zu halten.

4. Vorrichtung (1) nach Anspruch 3, wobei das Halteelement (15) ein Querstück umfasst, das sich über der bewegbaren Ebene (14) befindet und mit Druckeinrichtungen ausgestattet ist, die eingerichtet sind, um einen Druck auf die bewegbare Ebene (14) auszuüben.

5. Vorrichtung (1) nach Anspruch 3 oder 4, wobei die Beschichtungsfilmwalze (17) mit dem Halteelement (15) der Zuführmittel (13) verbunden und eingerichtet ist, um sich einstückig dazu zu bewegen.

6. Vorrichtung (1) nach Anspruch 1 oder 2, wobei die Beschichtungsfilmwalze (17) mit der bewegbaren Ebene (14) verbunden und eingerichtet ist, um sich integral mit dieser zu bewegen.

7. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die Zuführmittel (13) einen Motor (16) umfassen, der eingerichtet ist, um Schneckenschrauben (16') sowie ein Paar Schiebeblöcke, mit denen die bewegbare Ebene (14) verbunden ist, zu bewegen, wobei die Drehung der Schneckenschrauben (16') eine Schiebebewegung der Schiebeblöcke in einer Richtung parallel zu der Richtung (Y) veranlasst.

8. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei sich die bewegbare Ebene (14) zwischen einer eingezogenen Position, in der sie von den Fördermitteln (6) beabstandet ist, und einer Zuführposition, in der sie mit den Fördermitteln (6) teilweise überlappt, verschiebt.

9. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die Zuführmittel (13) eine Tragstruktur (F') umfassen, die an der Vorrichtung (1) drehbar befestigt ist, um faltende Zuführmittel zu bilden.

10. Vorrichtung (1) nach Anspruch 9, wobei die Tragstruktur (F') eingerichtet ist, um die bewegbare Ebene (14) von einer ersten Ruheposition, in der sie sich nahe einem unteren Abschnitt (20) der Vorrichtung (1) vertikal erstreckt, in eine zweite Betriebsposition, in der sie sich horizontal, im Wesentlichen parallel zu den Fördermitteln (6), erstreckt, anzutreiben.

11. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, umfassend Bewegungsmittel, die ausgelegt sind, um die Beschichtungsfilmwalze (17) weg von und hin zu einer Ebene (α) zu bewegen, in der die Bahn (2) liegt.

12. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei der Beschichtungsfilm (17) aus Cellophan hergestellt ist.

13. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, ferner umfassend Schneidmittel, die eingerichtet sind, um einen Abschnitt des Beschichtungsfilms, der auf der Bahn (2) angeordnet ist, von der Beschichtungsfilmwalze zu trennen.

14. Vorrichtung (1) nach einem der vorhergehenden Ansprüche, wobei die Fördermittel (6) ein Förderband umfassen, das den Schneidebereich (3) kreuzt, wobei die Vorrichtung ferner Ansaugmittel umfasst, die ausgelegt sind, um Luft an der Fläche des Förderbandes anzusaugen, um die Bahn (2) und den Beschichtungsfilm (17) auf der Fläche zu halten.

Revendications

1. Appareil (1) pour la découpe d'au moins une feuille (2) de matériau, comprenant :

- une zone de découpe (3) ;
- des moyens de transport (6) adaptés pour acheminer la feuille (2) dans ladite zone de découpe (3) le long d'une direction vers l'avant (Y) ;
- un rouleau de film de revêtement (17) adapté pour revêtir et maintenir la feuille (2) sur lesdits moyens de transport (6) ; et
- un support pour ledit rouleau de film de revêtement (17), ledit support étant configuré pour se déplacer par rapport aux moyens de transport (6) dans une direction qui est parallèle à la direction vers l'avant (Y),

caractérisé en ce qu'il comprend des moyens d'acheminement (13) adaptés pour acheminer la feuille (2) sur les moyens de transport (6), lesdits moyens d'acheminement (13) comprenant un plan

mobile (14) qui est configuré pour se rapprocher et s'éloigner desdits moyens de transport (6), dans lequel le support du rouleau de film de revêtement (17) est relié auxdits moyens d'acheminement (13).

2. Appareil (1) selon la revendication 1, dans lequel le rouleau de film de revêtement (17) est associé au support de façon à être déroulé et à revêtir une surface (S) de la feuille (2) lorsque ledit support se déplace dans une direction qui est opposée à ladite direction vers l'avant (Y) de la feuille (2).

3. Appareil (1) selon la revendication 1 ou 2, dans lequel les moyens d'acheminement (13) pour l'acheminement de la feuille (2) comprennent au moins un élément de maintien (15) configuré pour maintenir la feuille (2) au cours du déplacement du plan mobile (14).

4. Appareil (1) selon la revendication 3, dans lequel l'élément de maintien (15) comprend une traverse qui est au-dessus du plan mobile (14) et est équipée de presseurs qui sont configurés pour exercer une pression sur ledit plan mobile (14).

5. Appareil (1) selon la revendication 3 ou 4, dans lequel le rouleau de film de revêtement (17) est relié à l'élément de maintien (15) des moyens d'acheminement (13) et est configuré pour se déplacer d'un seul tenant vers celui-ci.

6. Appareil (1) selon la revendication 1 ou 2, dans lequel le rouleau de film de revêtement (17) est relié au plan mobile (14) et est configuré pour se déplacer d'un seul tenant vers celui-ci.

7. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens d'acheminement (13) comprennent un moteur (16) qui est configuré pour déplacer des vis sans fin (16'), ainsi qu'une paire de blocs coulissants auxquels ledit plan mobile (14) est relié, la rotation des vis sans fin (16') provoquant un mouvement de coulissement desdits blocs coulissants dans une direction parallèle à ladite direction (Y).

8. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel ledit plan mobile (14) est coulissant entre une position rétractée, dans laquelle il est espacé des moyens de transport (6), et une position d'acheminement, dans laquelle il est partiellement superposé auxdits moyens de transport (6).

9. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens d'acheminement (13) comprennent une structure de support (F') qui est fixée de manière rotative audit appareil (1) formant des moyens d'acheminement pliants.

10. Appareil (1) selon la revendication 9, dans lequel la structure de support (F') est configurée pour entraîner le plan mobile (14) d'une première position de repos, dans laquelle il est verticalement étendu près d'une partie inférieure (20) dudit appareil (1), à une seconde position opérationnelle, dans laquelle il est horizontalement étendu, sensiblement parallèlement aux moyens de transport (6).

11. Appareil (1) selon l'une quelconque des revendications précédentes, comprenant des moyens de déplacement adaptés pour éloigner et rapprocher le rouleau de film de revêtement (17) d'un plan (α) dans lequel la feuille (2) se situe.

12. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel ledit film de revêtement (17) est constitué de cellophane.

13. Appareil (1) selon l'une quelconque des revendications précédentes, comprenant des moyens de découpe supplémentaires qui sont configurés pour séparer une partie du film de revêtement agencée sur la feuille (2) par rapport au rouleau de film de revêtement.

14. Appareil (1) selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens de transport (6) comprennent une bande transporteuse qui traverse ladite zone de découpe (3), ledit appareil comprenant en outre des moyens d'aspiration qui sont adaptés pour aspirer de l'air au niveau de la surface de la bande transporteuse pour maintenir la feuille (2) et le film de revêtement (17) sur ladite surface.

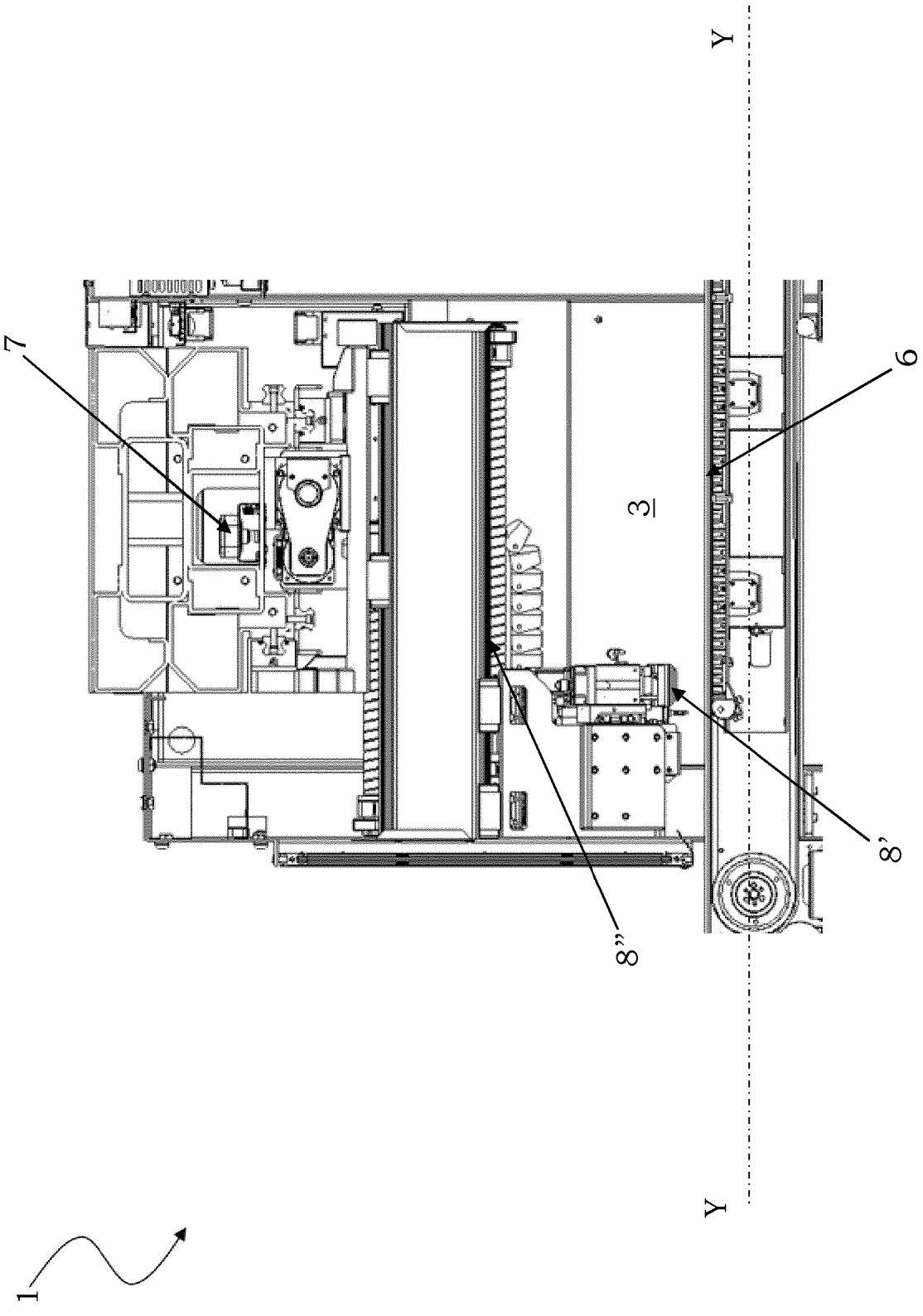

FIG. 1

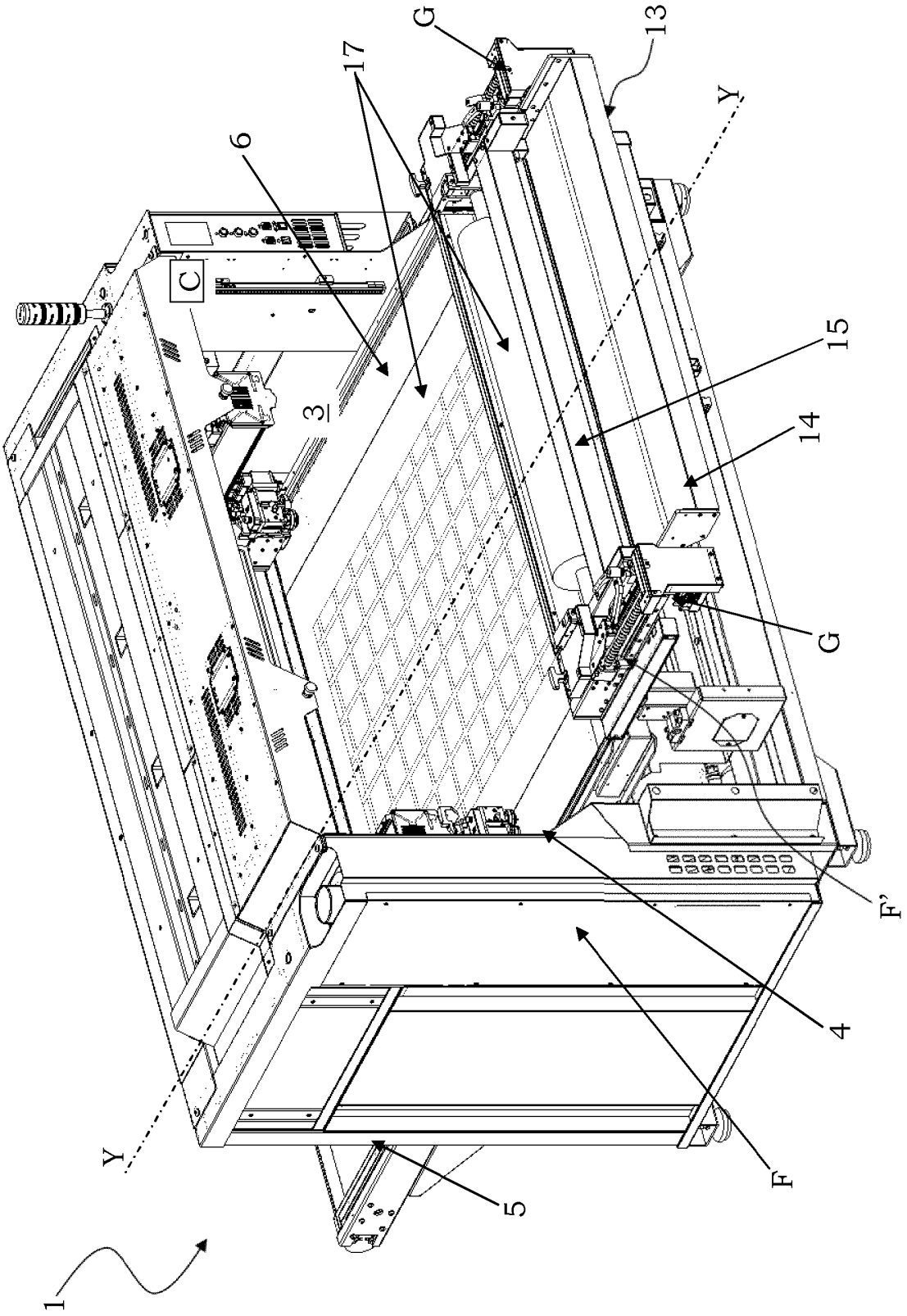

FIG. 2A

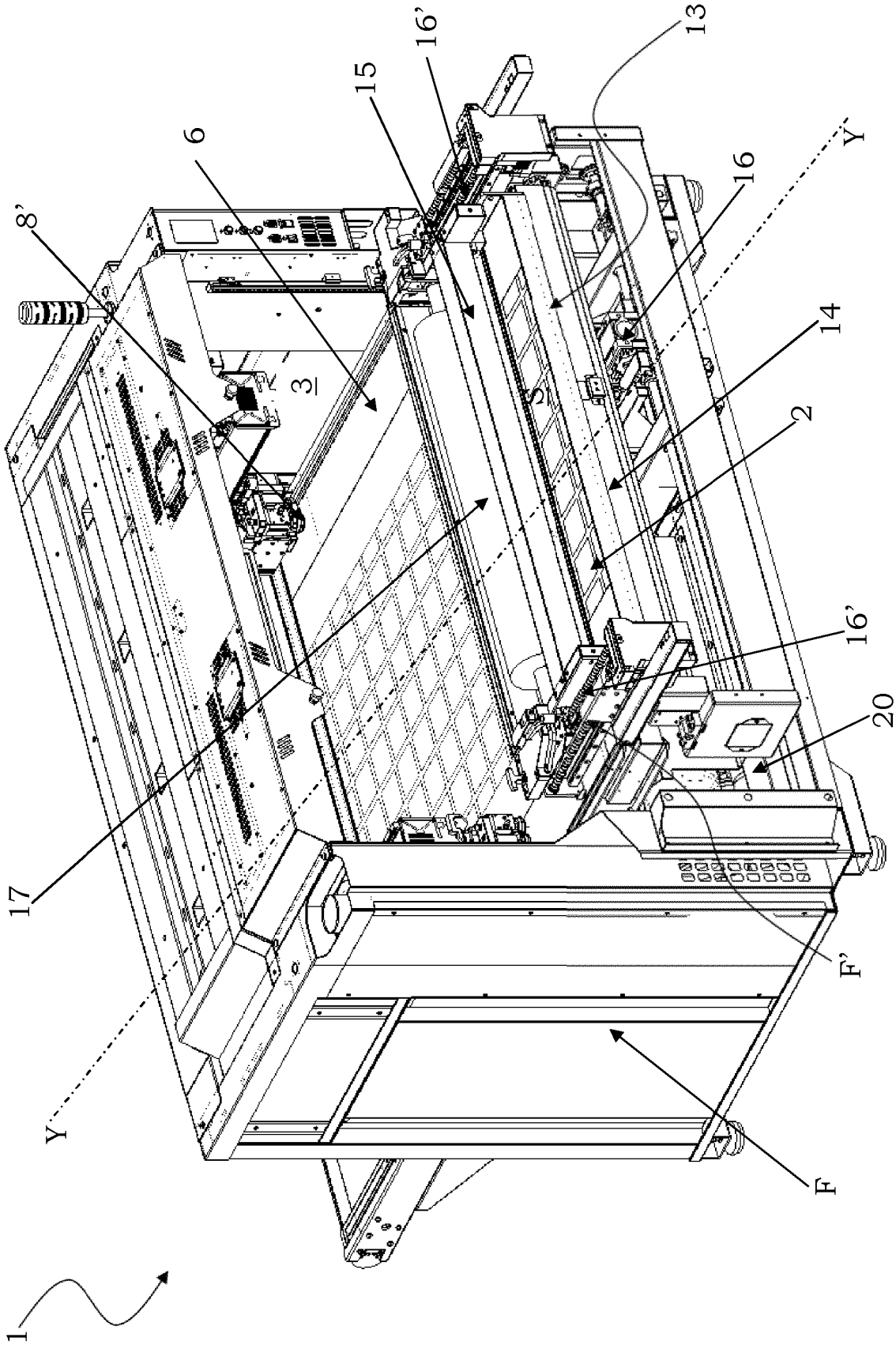

FIG. 2B

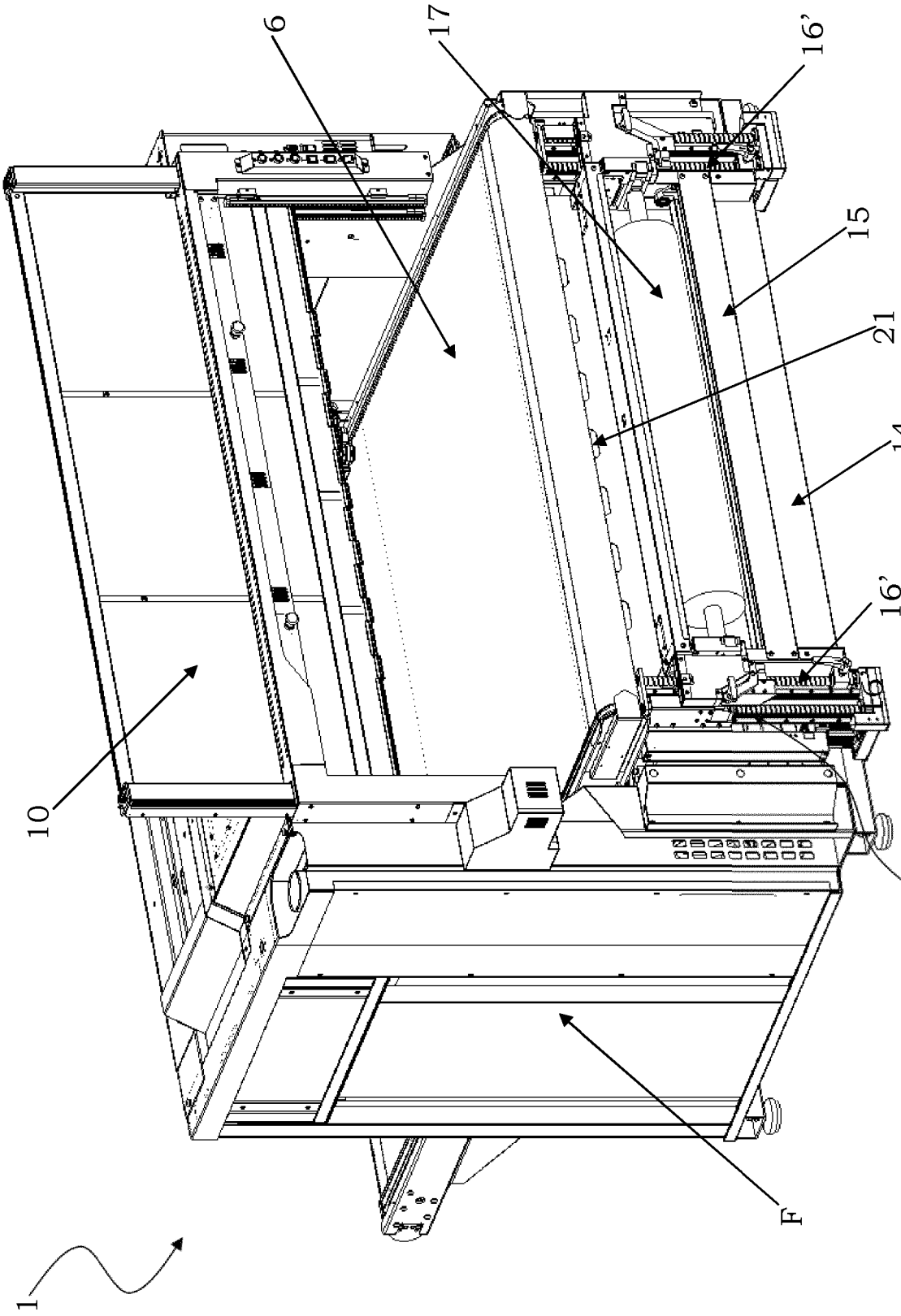

FIG. 2C

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5080297 A **[0007]**
- EP 0578903 A **[0007]**