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(71) Applicant: **Barberan Latorre, Jesús Francisco**
08860 Castelldefels (Barcelona) (ES)

(72) Inventor: **Barberan Latorre, Jesús Francisco**
08860 Castelldefels (Barcelona) (ES)

(74) Representative: **Plasseraud IP**
104 Rue de Richelieu
CS92104
75080 Paris Cedex 02 (FR)

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(54) **LAMINAR SUBSTRATE FEEDER AND PROCESSING MACHINE WHICH CAN BE COUPLED THERETO**

(57) The present invention relates to a laminar substrate feeder for processing machines comprising:
- supply and guiding elements for supplying and guiding at least one stack of laminar substrates (3) with a gauge (4) of adjustable height for the passage of a single laminar substrate (3.1) at a time,
- a suction feeding table (5) with a plurality of wheels (6) arranged integral with at least one rotating shaft to perform feeding by means of the movement of the laminar substrate (3.1),
- and traction means located after the gauge (4) in the direction of movement of the laminar substrate (3.1) to direct the laminar substrate (3.1) to the processing machine,
wherein the feeding table (5) is fixed and comprises control means configured to stop the rotation of the corresponding rotating shaft selectively.

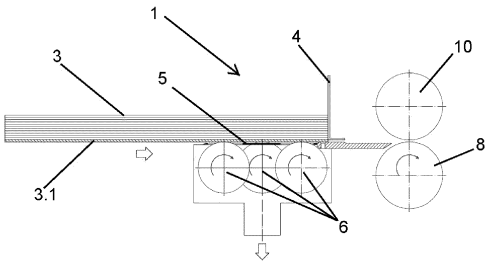

FIG. 4

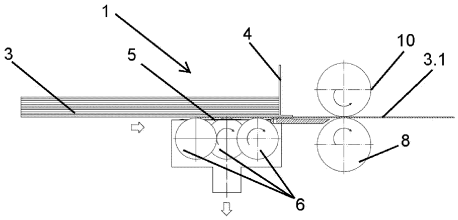

FIG. 5

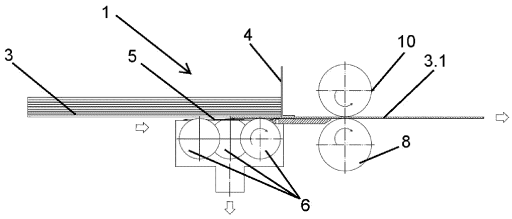

FIG. 6

Processed by Luminess, 75001 PARIS (FR)

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Description

Technical field

[0001] The present invention relates to machines for feeding laminar substrates such as, for example, cardboard sheets or corrugated cardboard to be fed to a cardboard processing machine, specifically a preparation product application machine such as, for example, for applying varnish or primer for subsequent digital printing.

State of the art

[0002] For cardboard processing, particularly for applying decorative or marking patterns by means of digital printing, it is often necessary to apply a preparation product, varnish, or primer before printing with ink. This process is carried out by a machine for applying preparation products using rollers which, by means of a combination of different rollers, applies a layer of a certain thickness of said preparation product on the cardboard surface. Conventionally these machines, before the entry of the cardboard into the applicator roller, comprise a vacuum table with wheels for directing the cardboard to the inlet of the applicator rollers in a suitable manner.

[0003] For process automation, these machines are combined with a cardboard feeder which is configured to hold a pile of stacked cardboard sheets and feeds them separately to the preparation machine. This cardboard feeder is arranged in a fixed location and the preparation product application machine is coupled thereto.

[0004] The feeder consists of a hopper or an adjustable area for supplying the stacked cardboards, comprising an adjustable gauge that leaves a passage gap corresponding to the thickness of the cardboard sheet. In the lower part of said hopper there is a table with a plurality of wheels for the movement/feeding of each cardboard sheet. In order to have a better traction, said feeding table comprises a suction table which causes the suction of the cardboard sheet, helping said wheels to better traction said cardboard sheet. Furthermore, at the outlet of the passage gap of the gauge, the feeder comprises a lower feeding roller and a corresponding hold-down roller thereon to move the cardboard sheet to the feed inlet of the preparation machine.

[0005] In an operating cycle of this feeder, the vacuum table causes the suction of a cardboard sheet, and through transmission of the rotation of the wheels said cardboard sheet is moved to the preparation or processing machine with a speed according to the needs of the preparation machine. When the cardboard sheet exits through the passage gap of the gauge and its front flank reaches the feeding roller and its hold-down roller, the suction table is raised such that the wheels no longer contact the cardboard sheet (the wheels are fixed and the top plate of the table moves up such that the line of horizontal tangency to the upper part of the wheels is below the upper level of the plate of the table to prevent contact), the wheels being actuated by a single motor. However, suction continues to exist, so the outgoing cardboard sheet and the cardboard sheet immediately above it which is ready to move out are suctioned against the suction table, being a static element that causes the retention of the cardboard sheet.

[0006] The outgoing cardboard sheet has sufficient traction to move out, due to the traction provided by the traction rollers, despite the retention caused by the raised suction table. In turn, the next cardboard sheet is retained as it contacts the raised suction table, preventing it from being driven along by the outgoing cardboard sheet. In that sense, when the rear flank of the cardboard sheet reaches the exit gap of the gauge, being free from the pile of cardboards, the suction table moves down to its initial position where the wheels make contact again with the next cardboard sheet to be extracted, starting the cycle again.

[0007] However, this embodiment raises a number of problems that translate into defects in the cardboard sheets and a lower productivity.

[0008] One of the problems that arises is the friction of the cardboard sheet with the suction table in its raised position, which makes making extra energetic efforts or performing greater hold-down with the hold-down roller necessary in order to achieve sufficient traction.

[0009] The need for the hold-down roller to enable pulling the cardboard sheet when the wheels are no longer in contact with the cardboard sheet upon raising the suction table means that certain cardboard sheets are marked due to the hold-down performed by the hold-down roller, rendering them unsuitable for later use.

[0010] Another problem that arises as a result of raising and lowering the suction table is the damage caused to the perimeter ends by tears, breaks, bending, etc., resulting from the guiding and retaining elements in the supply area for supplying the pile of cardboards. Furthermore, the movement for raising and lowering the suction table causes friction with the outlet gauge, again causing obstructions or damage that renders the cardboard sheet useless.

[0011] An additional problem arises due to the minimum length of the cardboard sheet that is to be fed in a given production process. During the operation of the feeder, so that the cardboard sheet has time to come out sufficiently from the gauge and be able to be pulled by the feeding roller and its hold-down roller, before the suction table is raised and the traction of its wheels is lost, in order for the rear flank of the cardboard sheet to exceed the first shaft with wheels and in order to prevent the wheels from feeding the next board sheet prematurely, a minimum length must be left between the rear part of the cardboard and the first shaft with wheels. This limitation leads to very short suction tables which, for longer cardboard sheets that might exist in other production batches, would not have sufficient traction force.

[0012] United States patent document US20220063938A1 seeks to solve one of the problems

mentioned above. In that sense, in order to eliminate the hold-down roller and to avoid damaging the cardboard sheet, document US20220063938A1 discloses a feeder with a suction table and its corresponding wheels at the outlet of the gauge, achieving the necessary traction to feed the machine, in this case a machine for processing cardboard for making boxes. This alternative solves the aforementioned problem of the hold-down roller, however, the movement of the suction table will still cause friction on the perimeters of the cardboard sheet.

[0013] Another problem identified in the feeder is in the cases in which it comprises two or more stacks of cardboard to be fed in parallel lines. In these cases, it is necessary to have an intermediate separator so that each cardboard sheet is positioned correctly in its line of movement. Since the suction feeding table moves, the separator cannot be supported as it would prevent the free movement of the suction table, leaving a space between the separator and the feeding table, this situation would cause the substrate being fed not being guided on the side of the separator at the time when the feeding table is down, so that obstructions or misalignments of the substrate during the feeding movement thereof may occur.

[0014] In view of the described drawbacks or limitations of the solutions existing today, there is a need for a solution that prevents damaging the cardboard sheets, while providing at the same time a faster movement of the cardboard sheets for feeding to a processing machine and smoother movements that will prevent misalignment.

Object of the invention

[0015] In order to meet this objective and solve the technical problems discussed so far, in addition to providing additional advantages which can be derived below, the present invention provides a laminar substrate feeder for processing machines comprising:

- supply and guiding elements for supplying and guiding at least one stack of laminar substrates with a gauge of adjustable height for the passage of a single laminar substrate at a time,
- a suction feeding table with a plurality of movement wheels arranged integral with at least one rotating shaft to perform feeding by means of the movement of the laminar substrate,
- and traction means located after the gauge in the direction of movement of the laminar substrate to direct the laminar substrate to the processing machine,

wherein the feeding table is fixed and comprises control means configured to stop the rotation of the corresponding rotating shaft selectively.

[0016] With this configuration, it is possible to keep the feeding table fixed, i.e., immobile, to receive the laminar substrates thereon, and stop the rotating shaft the wheels of which may interact with the next substrate prematurely, with corresponding rotating shaft being understood as an independently actuated rotating shaft or part of a group of shafts with a single independent actuation, which will be stopped selectively according to the substrate feeding requirements.

[0017] Rotating shaft of the invention is understood to mean shafts having the function of driving the substrate, and there may be additional shafts, for example, for distributing load support, but in this case without the additional driving function, said additional shafts therefore not being comprised in the definition of rotating shaft according to the invention. However, they could also be part of a practical alternative of the invention.

[0018] As a result of this arrangement, it is possible to keep the suction table fixed without having to raise it to prevent the traction of the wheels as occurs in the state of the art. Accordingly, the pile of substrates does not move, so damage to the perimeter ends of said substrates due to friction with the guiding and retaining elements of the supply and feeding area for supplying and feeding the stack of laminar substrates is prevented. Supply area is understood to be a hopper or a gap delimited by adjustable walls depending on the dimensions of the laminar substrate.

[0019] Another problem present in the state of the art which is solved with the invention is that friction with the suction table is prevented when it is in a raised position. In the present invention, the outgoing substrate is always in contact with the drive wheels until the exit thereof from the passage gauge, which reduces energy expenditure.

[0020] Additionally, traction maintenance by the wheels enables moving the substrate according to the required speed without having to use a hold-down roller, or reducing the hold-down pressure of said roller. It will be sufficient with the traction of the feeding roller located at the outlet plus the traction provided by the wheels that maintain contact with the laminar substrate which furthermore, given the absence of friction with the suction table like in the state of the art, leads to greater traction than in known solutions. This prevents the laminar substrate from being marked as a result of being held down by the roller and from having to be discarded.

[0021] Preferably, the control means of the laminar substrate feeder object of the invention are configured to stop the corresponding rotating shaft before the next laminar substrate being fed thereto contacts the wheels of said shaft.

[0022] Preferably, the laminar substrate feeder object of the invention comprises a plurality of rotating shafts with their corresponding wheels, comprising actuation means for each shaft and/or group of rotating shafts, and the control means being configured to stop the actuation means corresponding to the shaft or group of shafts to be stopped before the next laminar substrate being fed thereto contacts the feeding wheels of the corresponding rotating shaft.

[0023] In other words, the rotating shaft, whether independently actuated or being part of a group of shafts with

one and the same actuation to be stopped, will be stopped before it contacts the next substrate to be fed, in order to prevent the movement of the next substrate before its turn.

[0024] The moment in which the next substrate, which is being fed, could touch the wheels in a specific shaft, would mark the limiting moment for stopping the rotation of said rotating shaft, with the moment for stopping being determined by the control means. The stopping moment at which said next substrate would touch the wheels depends on the distance between shafts, substrate stiffness, substrate dimensions, weight of the stack of substrates, density of the substrate material, etc.

[0025] In that sense, said stopped shaft will no longer provide traction, preventing the next substrate from being driven along and from being able to cause obstructions. Preferably, the stopping of the shafts and their corresponding wheels will be successive with the passage of the laminar substrate until the exit thereof through the passage gauge, with all the shafts being subsequently actuated again for a new laminar substrate feeding cycle.

[0026] Another advantage derived from the present invention is that it is no longer necessary to leave a minimum length of the substrate before its rear flank encounters, during extraction, the first shaft with wheels so that it can be pulled by the feeding roller like in the state of the art. With this solution it will be possible to have a suction table that is as long as necessary.

[0027] According to a feature of the invention, the wheels integral with the rotating shaft are configured to have a free movement in the event that the rotating shaft thereof is stopped.

[0028] In this way, the wheels will rotate at the same time as the rotating shaft, but in the case in which a rotating shaft is stopped with a laminar substrate being fed, they will be free to rotate to prevent the laminar substrate being fed from suffering friction of the wheels due to the stopping of the rotating shaft. This configuration is particularly interesting when there are groups of shafts actuated by the same actuation, such that when stopping the actuation, all the shafts are stopped, or if for safety reasons it is desired to stop one of the rotating shafts which performs feeding before the passage of the rear flank of the substrate, or for example in the case in which the substrate has already taken traction with the traction means located after the gauge.

[0029] According to a feature of the invention, at least one rotating shaft can rotate in a direction opposite the corresponding direction for the movement of the laminar substrate, providing traction to the wheels in the opposite direction, being useful in case of having to reposition a laminar substrate which for whatever reason has been driven out when it was not the right time.

[0030] According to another feature of the invention, the feeding table comprises means for the lateral movement of the laminar substrate. The supply and guiding elements for supplying and guiding the laminar substrate feeder comprise a lateral guide or stop for the laminar substrate, however, to prevent obstructions, a clearance of preferably 0.5 mm on each side is left with respect to said guide. In that sense, the substrates may sometimes be rotated with respect to its feeding direction due to said clearance. Therefore, as a result of this configuration of the table with lateral movement means for the laminar substrate, it is possible to prevent the misalignment of the laminar substrate, for example, by moving the substrate to the left lateral guide thereof to be fed with reference to said left guide.

[0031] These lateral movement means for the substrate can be in the form of an engraving on the table which causes the substrates to tend to move laterally in the forward movement thereof towards the feed, or at least one wheel configured to move the substrate laterally to the corresponding lateral guide, being able to be, for example, inclined shafts, or wheels inserted with the shafts with feeding wheels. In this last case, the wheels could be concealed, for example, according to a pneumatic mechanism, being concealed when the substrate has already been brought against the lateral guide. In the case of inclined shafts, it is contemplated that after the substrate has been brought against the guide and the wheels thereof are exposed, the inclined rotating shafts are stopped, keeping the wheels thereof free to rotate towards the direction of forward movement, with the feeding being carried out by the rotating feeding shafts mentioned above.

[0032] As a result of this configuration, the alignment of the substrate can be corrected, being linked to the feature of the feeding table being fixed, which would not be possible in the known state of the art.

[0033] Preferably, the traction means at the outlet of the gauge are at least one feeding roller, or a feeding roller with its corresponding hold-down roller.

[0034] Even more preferably, the traction means at the outlet of the gauge are a secondary suction feeding table with wheels for movement with shafts actuated independently and/or shafts actuated together by a single or several actuations. This configuration is possible as a result of traction maintenance by the wheels of the feeding table which maintain contact with the outgoing substrate. Combination of a secondary suction table at the outlet of the gauge, together with a feeding roller, is also contemplated based on the speed requirements of the processing machine.

[0035] Preferably, the actuation means are servomotors, which facilitates greater control of the acceleration and braking of the wheels.

[0036] According to a feature of the invention, the feeding table comprises at least two suction areas, the control means being configured to activate/deactivate said suction areas selectively. This segmented suction table configuration is an interesting embodiment option for a feeding table having a length suitable for laminar substrates with large dimensions, such that each suction area can be activated or deactivated according to the lengths of the substrates being fed at any given time.

[0037] According to a feature of the invention, the laminar substrate feeder comprises a separator that can be fixed in the feeding table for separating and aligning laminar substrates when they are fed in a parallel manner. Given that the suction table is fixed, a movable separator design like in the state of the art is not required, thereby reducing manufacturing difficulty and costs, and being a more reliable embodiment without mechanical elements susceptible to failure. This feature, in combination with the lateral movement means for the laminar substrate mentioned above, allow bringing the substrate against the separator so that it acts as a reference, which was not possible in the state of the art since there is a space between the separator and the feeding table for raising the table itself.

[0038] According to another feature of the invention, the laminar substrate feeder comprises movement means for the movement thereof to another location, preferably wheels that allow the movement thereof in the direction of movement of the substrate during feeding, in order to connect same to the corresponding processing machine or to perform maintenance work.

[0039] According to another aspect, the invention also relates to a laminar substrate processing machine, preferably a preparation product application machine, with movement means for moving in the direction of movement of the laminar substrate, and connectable to the feeding inlet of the processing machine, in this case to the preparation product application rollers, the substrate feeder comprising a secondary suction table at the outlet of the gauge providing the traction necessary for feeding the substrate to the processing machine. There is a need to mention that conventionally processing machines of this type comprise a suction feeding table with wheels at the inlet for feeding and accelerating the laminar substrate from the laminar substrate feeder, however, with this configuration it is possible to dispense with the feeding table in the preparation product application machine, where the machine can be coupled to laminar substrate feeder. As a result of this configuration, maintenance work, particularly for cleaning, is facilitated, providing better access to the metering and preparation product application rollers of the processing machine. Furthermore, continuity is provided for transporting the laminar substrates.

Description of the figures

[0040]

Figure 1 shows a schematic elevational view of a laminar substrate feeder according to the state of the art before the laminar substrate starts its movement.

Figure 2 shows a schematic elevational view of a laminar substrate feeder according to the state of the art with the black arrow indicating the raising of the suction table.

Figure 3 shows a schematic elevational view of a laminar substrate feeder according to the state of the art with the black arrow indicating the lowering of the suction table.

Figure 4 shows a schematic elevational view of a preferred embodiment of a laminar substrate feeder according to the object of the invention before the laminar substrate starts its movement.

Figure 5 shows a schematic elevational view of a preferred embodiment of a laminar substrate feeder according to Figure 4 at the time when the rear flank of the laminar substrate has passed the first shaft with wheels.

Figure 6 shows a schematic elevational view of a preferred embodiment of a laminar substrate feeder according to Figure 4 at the time when the rear flank of the laminar substrate has passed the second shaft with wheels.

Figure 7 shows a schematic elevational view of a preferred embodiment of a laminar substrate feeder according to Figure 4 at the time when the rear flank of the laminar substrate has reached the last shaft with wheels.

Figure 8 shows a schematic elevational view of a preferred embodiment of a laminar substrate feeder according to Figure 4 at the time the laminar substrate has moved out of the passage gauge.

Figure 9 shows a schematic perspective/top view of an alternative embodiment of the laminar substrate feeder with two feeding lines.

Figure 10 shows a schematic elevational view of an alternative embodiment of the invention with a longer suction table.

Figure 11 shows a schematic elevational view of a laminar substrate feeder coupled to a preparation product application machine, according to the state of the art.

Figure 12 shows a schematic elevational view of a preferred embodiment of a laminar substrate feeder coupled to a product application machine according to the object of the invention.

Detailed description of the invention

[0041] In light of the aforementioned figures, and in accordance with the adopted numbering, one may observe therein a preferred exemplary embodiment of the

invention, which comprises the parts and elements indicated and described in detail below.

[0042] According to Figures 1 to 3, an embodiment according to the state of the art can be seen. As can be seen in Figure 1, the length L2 from the passage gauge (4') to the cardboard sheet (3.1') held down by a hold-down roller (10') must be smaller than the length L1 from the rear flank or edge of the cardboard sheet (3.1') to the vertical of the shaft with the first wheels (6') which said edge of the cardboard sheet (3.1') would encounter during its travel so that no moving wheel (6') is in contact with the next cardboard sheet to be fed. Said relationship between lengths L1 and L2 must be fulfilled for substrates having a smaller length such as a cardboard sheet (3.1') of about 600 mm long, the feeding table (5') would have a limited length, resulting in a feeding table (5') that would not be valid for very long cardboard sheets (3.1').

[0043] Furthermore, to prevent the next cardboard sheet from coming into contact with the wheels (6') when the outgoing cardboard sheet (3.1') is being fed, as can be seen in Figure 2, a feeding table (5') is raised, such that as said feeding table (5') moves up, since the wheels (6') are fixed, they do not contact the next cardboard sheet (3').

[0044] Once the rear edge of the cardboard sheet (3.1') has passed the gauge (4') and is pulled by the hold-down roller (10') and the feeding roller (8'), as can be seen in Figure 3, the suction table (5') moves down to its initial position, allowing the next cardboard sheet to move down and contacts the wheels (6') for movement thereof.

[0045] As indicated, said movement of the suction table (5') generates frictions on the cardboard sheets (3.1'), and when the suction table (5') is in the raised position, the cardboard sheet (3.1') is slowed down by the friction with said suction table (5'), so there is a need for greater traction with the feeding roller (8') which requires the pressure exerted by the hold-down roller (10') to be higher, and accordingly marks and defects are produced on the cardboard sheets (3.1') which make it necessary to discard them.

[0046] To solve these problems arising in the state of the art, taking into consideration Figures 4 to 8, a cycle of the feeding process of a practical embodiment for feeding a laminar substrate feeder (1) according to the invention, the laminar substrate preferably being a cardboard sheet (3.1), can be visualized.

[0047] It can be seen in Figure 4 how the cardboard sheet (3.1) of the stack of cardboards (3), as a result the weight it has on top due to the stack of cardboards (3), contacts the suction feeding table (5) and the corresponding wheels (6) which rotate for applying thereto the acceleration necessary for feeding the cardboard sheet (3.1) to a processing machine.

[0048] The novelty of the invention lies in the moment of the cycle depicted in Figure 5, in this case the suction table (5) is fixed, and to prevent the next cardboard sheet from being able to be driven along prematurely, once the rear edge of the cardboard sheet (3.1) has reached the vertical of the shaft with the first wheels (6), such that said shaft stops when it passes the vertical and before the next cardboard sheet contacts the wheels (6). The other shafts with wheels (6) will continue to move, providing traction to the cardboard sheet (3.1).

[0049] To perform said stopping of the shaft, the invention preferably comprises an independent actuation for each shaft with wheels (6), said actuation preferably being a servomotor, such that the cardboard feeder (1) comprises control means that provide stop signal to the servomotor which actuates the first shaft with wheels (6).

[0050] The moment in which the rear flank of the cardboard sheet (3.1) has reached the first shaft with wheels (6) will be calculated by the control means, for example, by reading times at the outlet of the rollers (8, 10) where readings of the front and rear flanks of the cardboard sheets (3.1) are performed so as to control the performance of proper feeding.

[0051] In that sense, based on said readings, the dimensions of the cardboard sheet (3.1), and the feeding speeds, etc., the control means calculate when the rear flank of the cardboard sheet (3.1) will reach the shaft with wheels (6) and, with said information, will send the stop signal to the servomotor.

[0052] As can be seen in Figure 6, when the rear flank of the cardboard sheet (3.1) reaches the second shaft with wheels (6), the second servomotor will stop in the same way as the first shaft, with the third shaft with wheels (6) being in motion. With this configuration, the next cardboard sheet will be supported on the fixed suction feeding table (5), but it will not be driven along as there is no traction, and the outgoing cardboard sheet (3.1) will have sufficient traction so as not to require a hold-down roller (10) or so that the pressure exerted by said hold-down roller (10) is minimum and does not produce defects on the cardboard sheets (3.1).

[0053] In relation to Figure 7, once the rear flank of the cardboard sheet (3.1) has passed the last shaft with wheels (6), the last shaft and its corresponding wheels (6) will stop, with the cardboard sheet (3.1) being fed to the processing machine with sufficient traction provided by the roller (8) and/or the hold-down roller (10) thereof.

[0054] Once the cycle ends, after the rear flank of the substrate is free from the stack of cardboards during its forward movement, all the shafts with wheels (6) will be actuated by means of the servomotors to provide traction to the next cardboard sheet and to start a new cycle.

[0055] According to an alternative embodiment, an arrangement of a cardboard feeder (1) with two feeding lines, comprising a separator (9) fixed in the feeding table (5) which separates and guides both cardboard sheets (3.1) can be seen in Figure 9. In this case, adaptation to the different dimensions of the cardboard sheets will be performed by retention and guiding means in the storage area of the stack of cardboards (3), said separator (9) being fixed on the feeding table (5) at all times. This arrangement facilitates manufacture and prevents errors and faults that may occur in solutions known in the state

of the art which comprise a gap between the feeding table and the separator to allow the feeding table to move up.

[0056] An embodiment can be seen in Figure 10 in which, as a result of the advantages provided by the invention, specifically as a result of the greater traction provided by the wheels (6) which maintain the movement of the cardboard sheet (3.1) until the exit thereof through the gauge (4), it is possible to use longer cardboard sheets (3.1) even, for example, of up to 5000 mm. To that end, a longer suction table (5) will be required in order to have more wheels (6) to provide greater traction.

[0057] In this case, for adaptation to different lengths, it is contemplated for the suction table (5) to be segmented, such that there are several suction areas (5.1). Depending on the length of the stack of cardboards (3), the control means will close the suction of the suction areas (5.1) that are outside the length of the stack of cardboards (3) and the corresponding shafts with wheels (6) will remain motionless. A versatile cardboard feeder (1) adapted for different lengths of cardboard (3.1) is thereby achieved.

[0058] According to another aspect of the invention, a processing machine for processing the cardboard which can be coupled to the cardboard feeder (1) and the assembly formed by both machines are also contemplated. For the practical embodiment shown in the figures, the processing machine is preferably a preparation product application machine (11).

[0059] Based on the state of the art shown in Figure 11, it can be seen how conventionally the cardboard feeder (1') is fixed in a production line, whereas the preparation product application machine (11') is movable in the direction perpendicular to the sheet.

[0060] For this embodiment of the state of the art, the preparation product application machine (11') comprises a feeding suction table (11.1) for the cardboard sheet (3.1) to provide the necessary speed to said cardboard sheet (3.1) at the inlet of the application rollers (13'). With this solution, for maintenance work, the machine (11') is uncoupled from the cardboard feeder (1'), however, access for cleaning the metering roller (12') and the application rollers (13') is difficult due to the presence of the suction feeding table (11.1) which prevents readily accessing said rollers for cleaning, resulting in long shutdowns for maintenance which considerably reduce production.

[0061] This problem is solved in the invention for an embodiment in which the cardboard feeder (1) comprises a secondary suction table (7) with its corresponding wheels (7.1) at the outlet of the gauge (4). With this configuration, suitable speed is provided to the cardboard sheet (3.1) according to the requirements of the application rollers (13) of the preparation product application machine (11), and since the feeding roller (8) and its corresponding hold-down roller (10) do not have to be included due to the traction provided by the secondary suction table (7), in this case, the cardboard feeder (1) can be coupled directly to the preparation product application machine (11) without a suction feeding table (11.1).

[0062] As can be seen in Figure 12, both the cardboard feeder (1) and the preparation product application machine (11) have movement means for moving in the direction of movement of the cardboard sheet (3.1), such that they can be coupled directly, providing continuity in the movement of the cardboard sheet (3.1) from the stack of cardboards (3) to the application roller (13) of the preparation product application machine (11).

[0063] According to an alternative embodiment, as can be seen in Figure 13, the feeding table (5) comprises means for the lateral movement of the cardboard sheet (3.1), in this case rotating shafts with wheels (6) inclined with respect to the perpendicular to the direction of movement of the cardboard sheet (3.1), such that the cardboard sheet (3.1) is moved to the lateral guide of the guiding and supply area (2) or to the separator (5), to take it as a reference when feeding the cardboard sheet (3.1) to the processing machine.

[0064] All the distinctive features of the invention that have been mentioned provide a greater productivity as higher feeding speeds of the cardboard sheet are achieved since defects derived from frictions, from hold-down performed by the hold-down roller are not produced and obstructions do not occur. This further provides smoother movements which prevent misalignments, etc.

Claims

1. A laminar substrate feeder for processing machines, comprising:

   - supply and guiding elements (2) for supplying and guiding at least one stack of laminar substrates (3) with a gauge (4) of adjustable height for the passage of a single laminar substrate (3.1) at a time,
   - a suction feeding table (5) with a plurality of wheels (6) arranged integral with at least one rotating shaft to perform feeding by means of the movement of the laminar substrate (3.1),
   - and traction means located after the gauge (4) in the direction of movement of the laminar substrate (3.1) to direct the laminar substrate (3.1) to the processing machine,

   characterized in that the feeding table (5) is fixed and comprises control means configured to stop the rotation of the corresponding rotating shaft selectively.

2. The laminar substrate feeder (1) according to claim 1, wherein the control means are configured to stop the corresponding rotating shaft before the next laminar substrate (3.1) being fed thereto contacts the wheels (6) of said shaft.

3. The laminar substrate feeder (1) according to claim 1 or 2, comprising a plurality of rotating shafts with their corresponding wheels (6), comprising actuation means for each shaft and/or group of rotating shafts, the control means being configured to stop the actuation means corresponding to the shaft or group of rotating shafts to be stopped before the next laminar substrate (3.1) being fed thereto contacts the wheels (6) of the corresponding rotating shaft.

4. The laminar substrate feeder (1) according to any one of the preceding claims, wherein the wheels (6) are configured to have a free movement in the event that the rotating shaft thereof is stopped.

5. The laminar substrate feeder (1) according to any one of the preceding claims, wherein at least one rotating shaft can rotate in a direction opposite that of the movement of the cardboard sheet.

6. The laminar substrate feeder (1) according to any one of the preceding claims, wherein the feeding table (5) comprises lateral movement means for the laminar substrate (3.1).

7. The laminar substrate feeder (1) according to the preceding claim, wherein the lateral movement means for the laminar substrate (3.1) are at least one wheel (14) configured to move the laminar substrate (1) laterally towards the lateral guide of the supply and guiding elements (2).

8. The laminar substrate feeder (1) according to any one of the preceding claims, wherein the traction means are at least one feeding roller (8).

9. The laminar substrate feeder (1) according to any one of claims 1 to 7, wherein the traction means are a secondary suction feeding table (7) with wheels (7.1) for movement with shafts actuated independently and/or shafts actuated together by means of a single actuation.

10. The laminar substrate feeder (1) according to any one of the preceding claims, wherein the actuation means are servomotors.

11. The laminar substrate feeder according to any one of the preceding claims, wherein the feeding table (5) comprises at least two suction areas (5.1), the control means being configured to activate/deactivate said suction areas (5.1) selectively.

12. The laminar substrate feeder according to any one of the preceding claims, comprising a separator (9) that can be fixed in the feeding table (5) for separating laminar substrates (3.1) when they are fed in a parallel manner.

13. The laminar substrate feeder according to any one of the preceding claims, comprising movement means for the movement thereof to another location.

14. A processing machine with movement means of the machine, and with the feed inlet thereof connectable to a cardboard feeder (1) according to any one of claims 7 to 13.

Amended claims in accordance with Rule 137(2) EPC.

1. A laminar substrate feeder for processing machines, comprising:

   - supply and guiding elements (2) for supplying and guiding at least one stack of laminar substrates (3) with a gauge (4) of adjustable height for the passage of a single laminar substrate (3.1) at a time,
   - a suction feeding table (5) with a plurality of wheels (6) arranged integral with at least one rotating shaft to perform feeding by means of the movement of the laminar substrate (3.1),
   - and traction means located after the gauge (4) in the direction of movement of the laminar substrate (3.1) to direct the laminar substrate (3.1) to the processing machine,
   wherein the feeding table (5) is fixed and comprises control means configured to stop the rotation of the corresponding rotating shaft selectively,
   characterized in that the wheels (6) are configured to have a free movement in the event that the rotating shaft thereof is stopped.

2. The laminar substrate feeder (1) according to claim 1, wherein the control means are configured to stop the corresponding rotating shaft before the next laminar substrate (3.1) being fed thereto contacts the wheels (6) of said shaft.

3. The laminar substrate feeder (1) according to claim 1 or 2, comprising a plurality of rotating shafts with their corresponding wheels (6), comprising actuation means for each shaft and/or group of rotating shafts, the control means being configured to stop the actuation means corresponding to the shaft or group of rotating shafts to be stopped before the next laminar substrate (3.1) being fed thereto contacts the wheels (6) of the corresponding rotating shaft.

4. The laminar substrate feeder (1) according to any one of the preceding claims, wherein at least one rotating shaft can rotate in a direction opposite that of the movement of the cardboard sheet.

5. The laminar substrate feeder (1) according to any one of the preceding claims, wherein the feeding table (5) comprises lateral movement means for the laminar substrate (3.1).

6. The laminar substrate feeder (1) according to the preceding claim, wherein the lateral movement means for the laminar substrate (3.1) are at least one wheel (14) configured to move the laminar substrate (1) laterally towards the lateral guide of the supply and guiding elements (2).

7. The laminar substrate feeder (1) according to any one of the preceding claims, wherein the traction means are at least one feeding roller (8).

8. The laminar substrate feeder (1) according to any one of claims 1 to 6, wherein the traction means are a secondary suction feeding table (7) with wheels (7.1) for movement with shafts actuated independently and/or shafts actuated together by means of a single actuation.

9. The laminar substrate feeder (1) according to any one of claims 3 to 8, wherein the actuation means are servomotors.

10. The laminar substrate feeder according to any one of the preceding claims, wherein the feeding table (5) comprises at least two suction areas (5.1), the control means being configured to activate/deactivate said suction areas (5.1) selectively.

11. The laminar substrate feeder according to any one of the preceding claims, comprising a separator (9) that can be fixed in the feeding table (5) for separating laminar substrates (3.1) when they are fed in a parallel manner.

12. The laminar substrate feeder according to any one of the preceding claims, comprising movement means for the movement thereof to another location.

13. A processing machine with movement means of the machine, and with the feed inlet thereof connectable to a cardboard feeder (1) according to any one of claims 6 to 12.

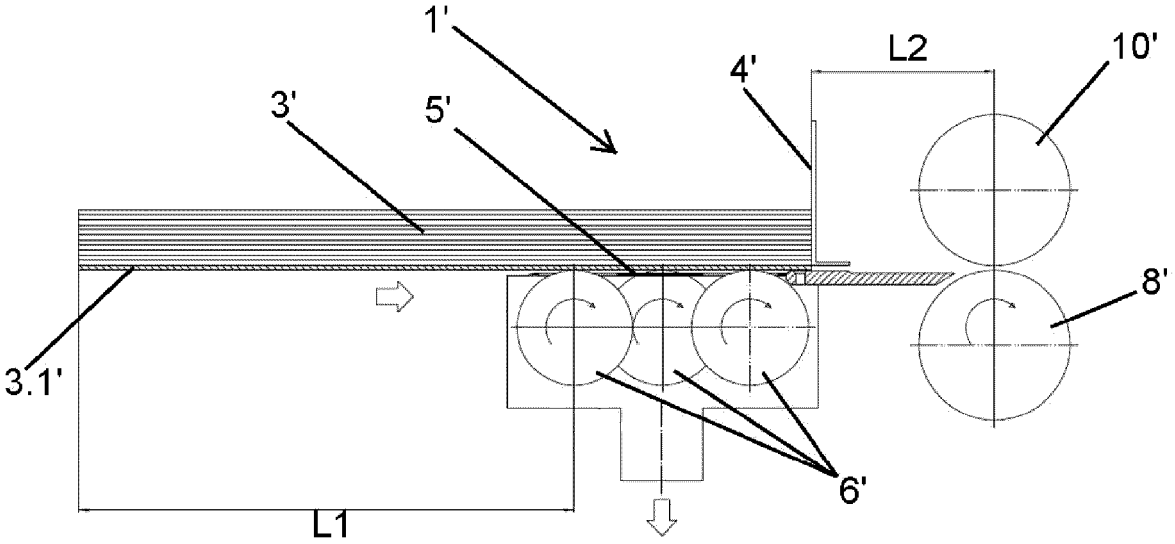

FIG. 1

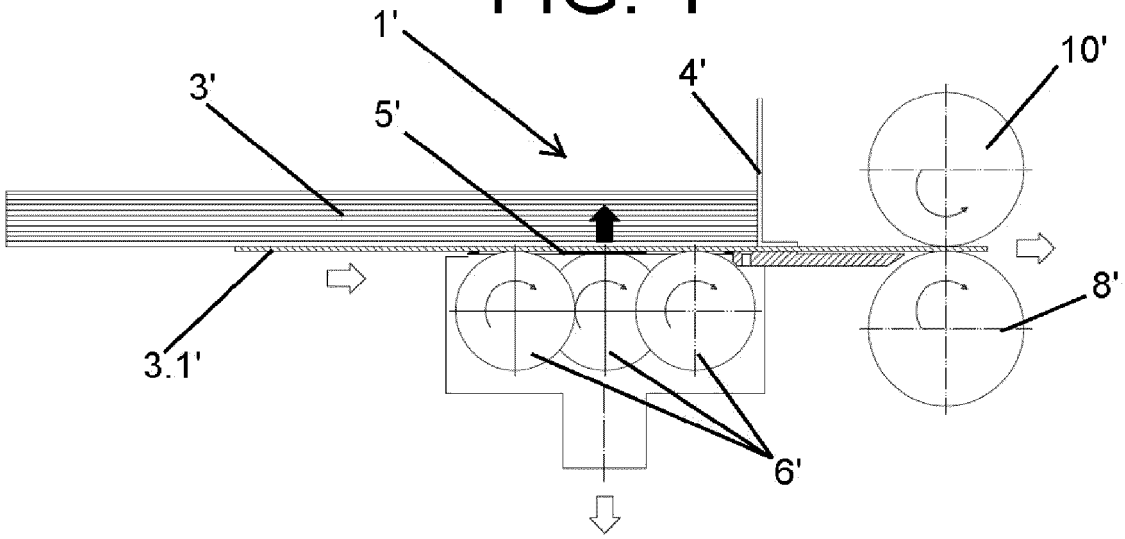

FIG. 2

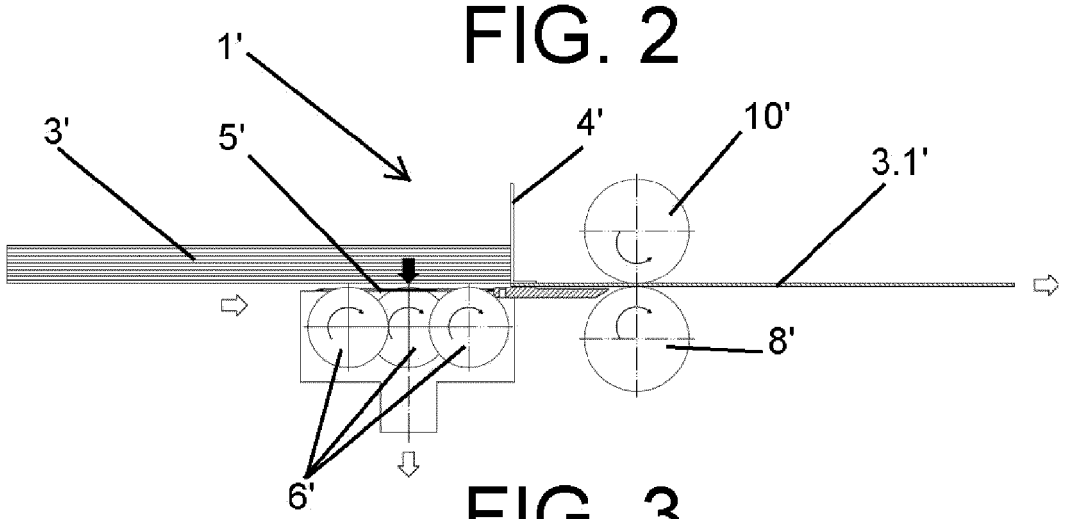

FIG. 3

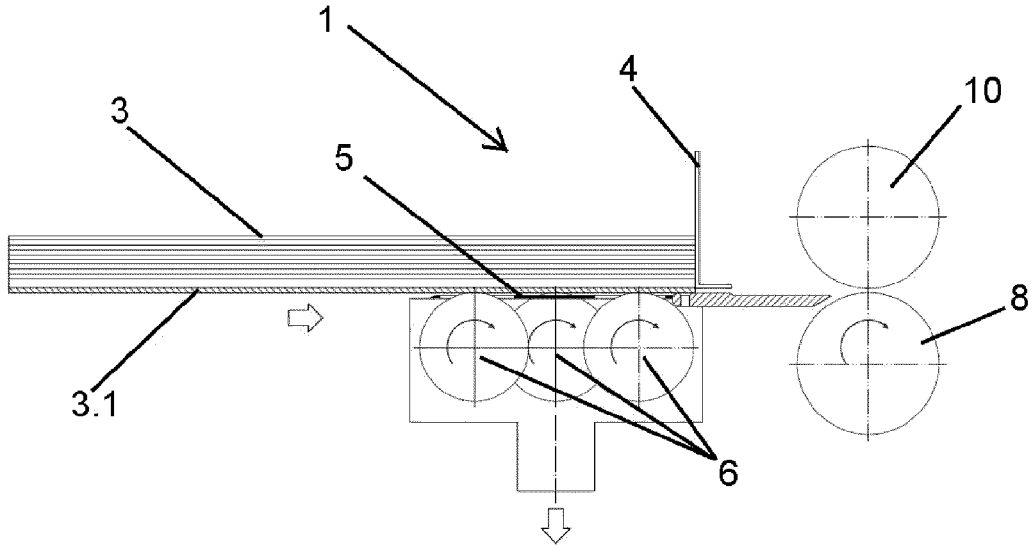

FIG. 4

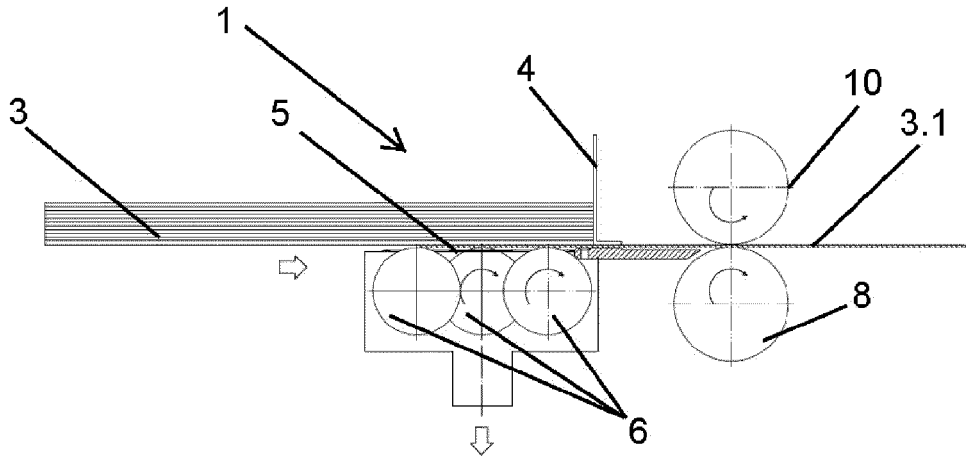

FIG. 5

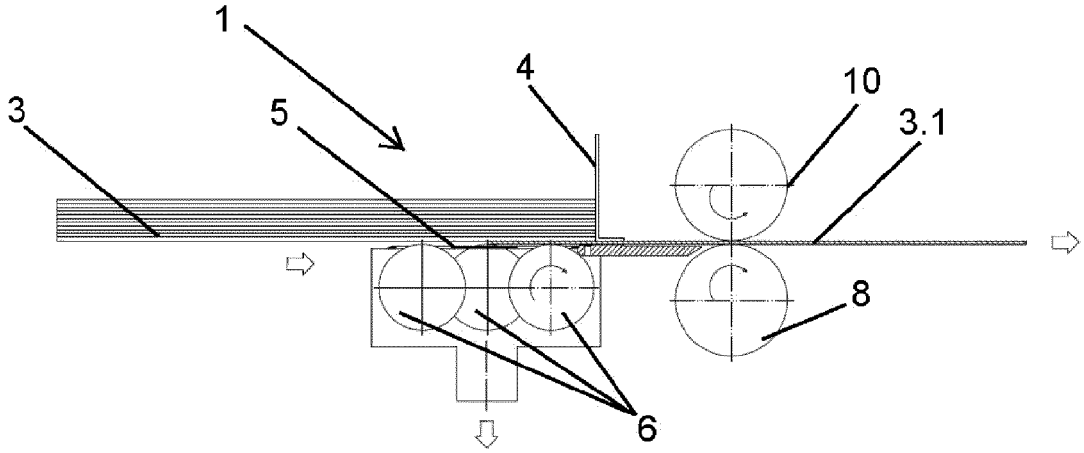

FIG. 6

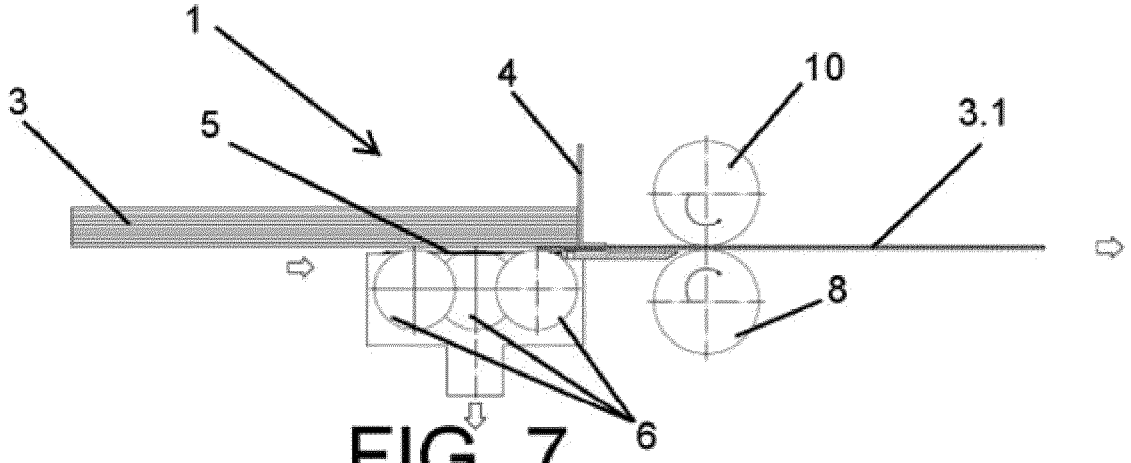

FIG. 7

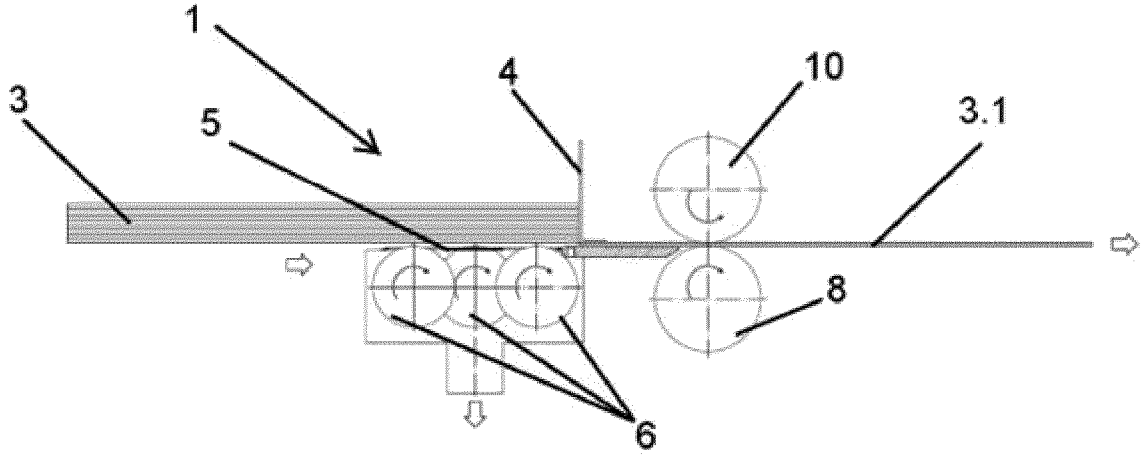

FIG. 8

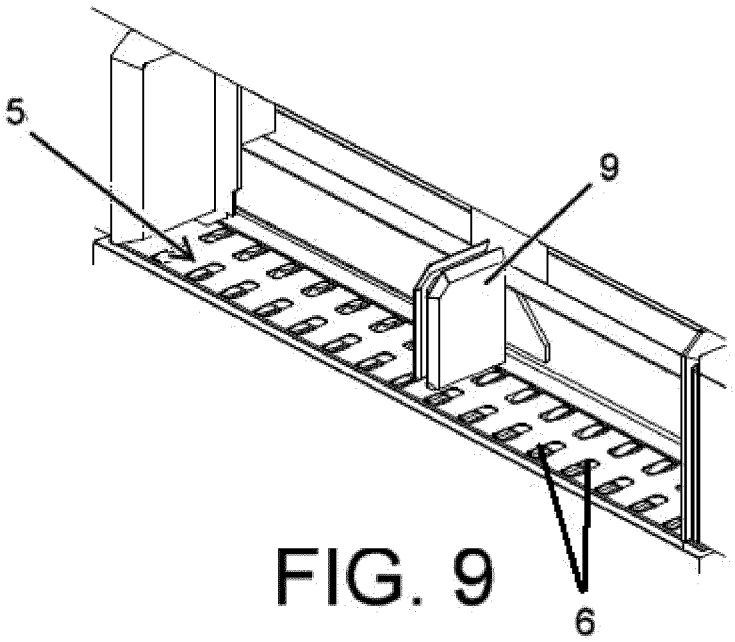

FIG. 9

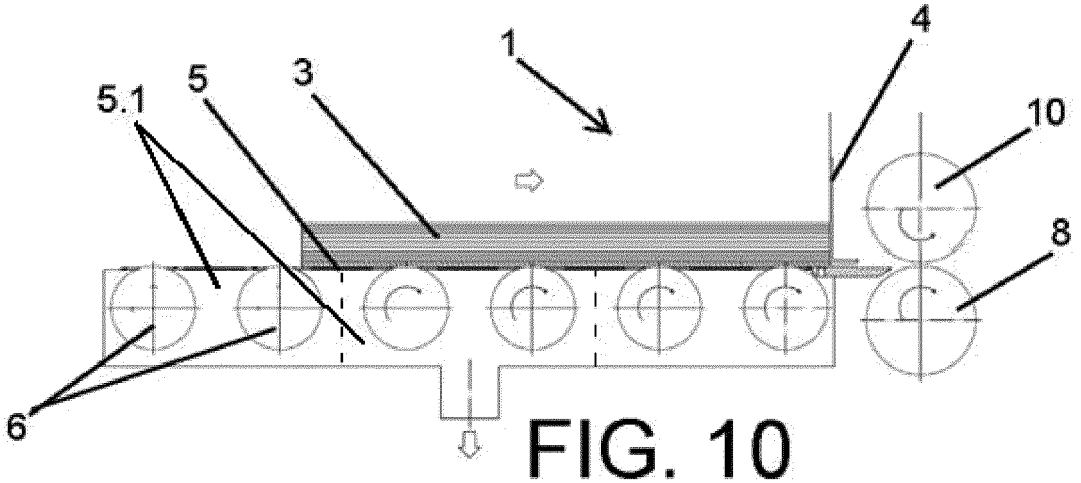

FIG. 10

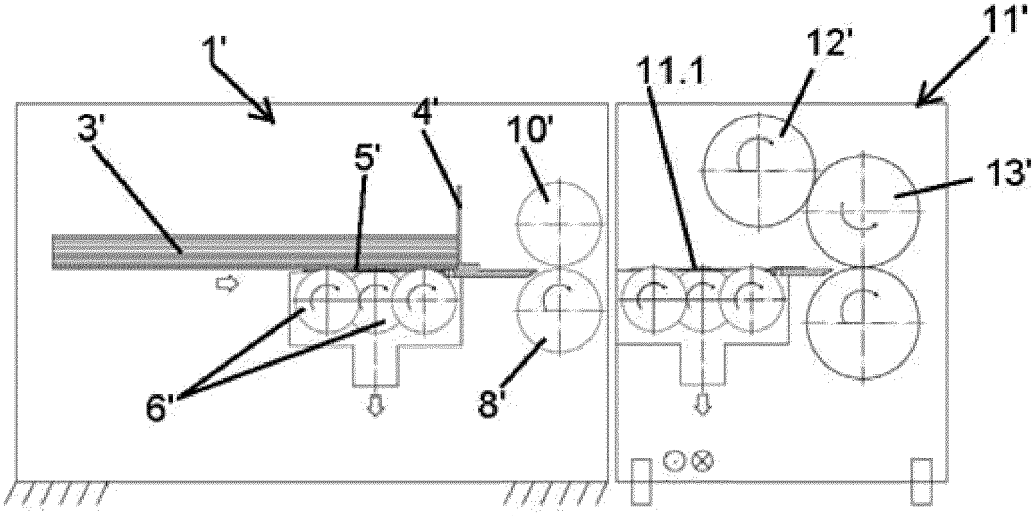

FIG. 11

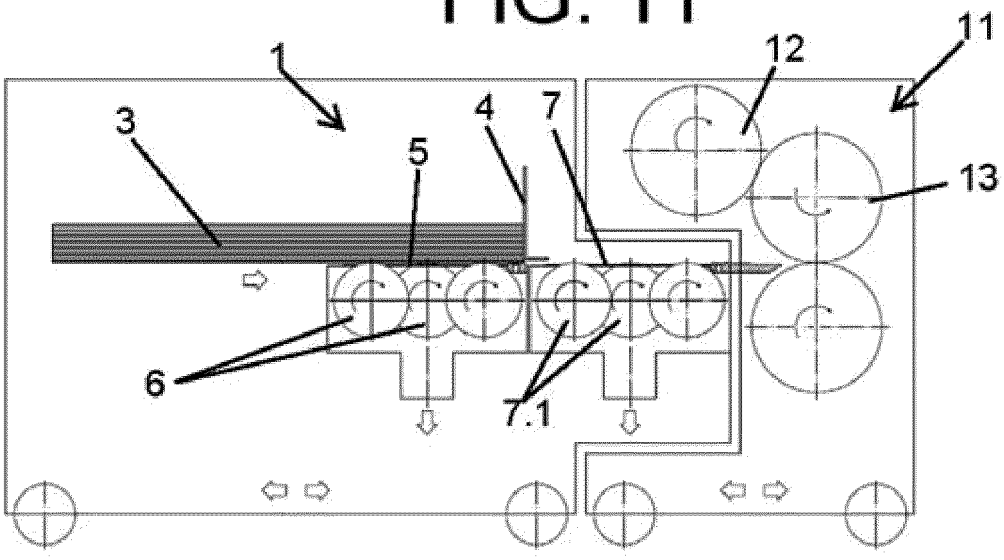

FIG. 12

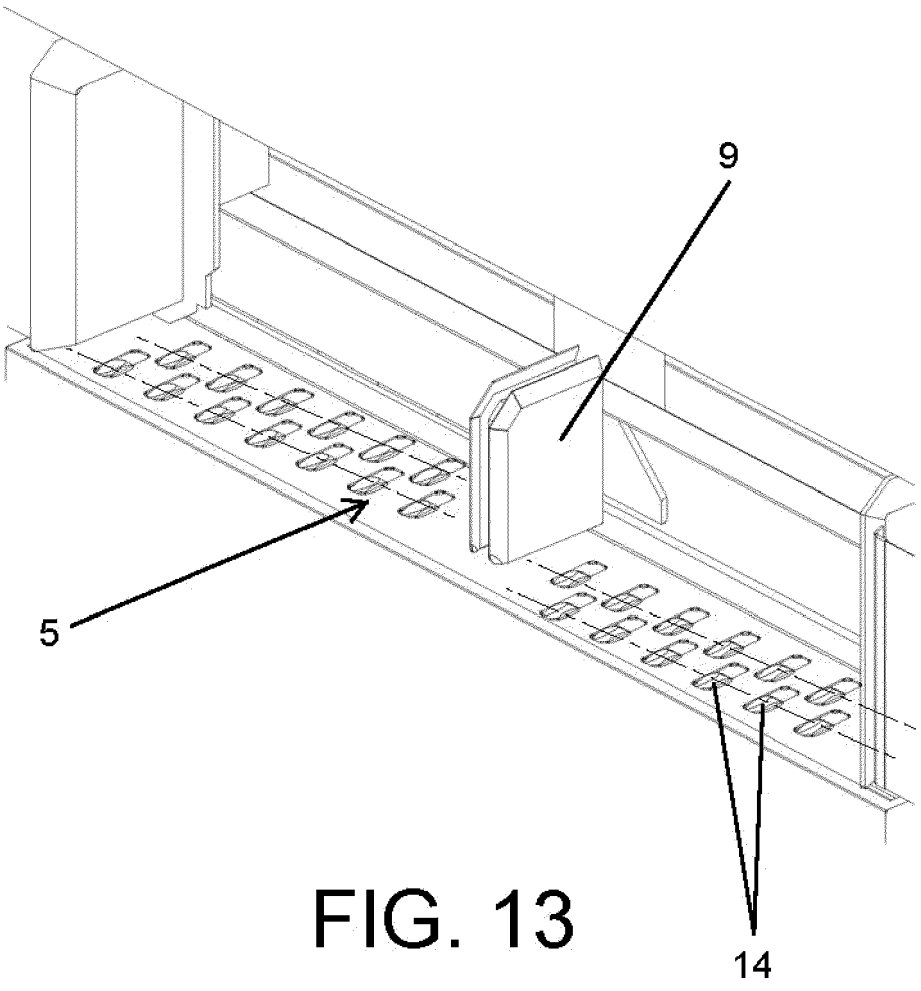

FIG. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 23 38 2557

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Place of search	Date of completion of the search	Examiner
The Hague	10 November 2023	Ureta, Rolando

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