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(54) **Apparatus for cutting cardboard panels into strips**

Vorrichtung zum Schneiden von Panele aus Karton in Streifen

Dispositif pour la découpe des paneaux en carton en bandes

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(73) Proprietor: **Serafin Franco S.r.l.**
33170 Pordenone (IT)

(72) Inventor: **Serafin, Riccardo**
31046 Oderzo (TV) (IT)

(74) Representative: **Giugni, Diego et al**
Propria S.r.l.
Via della Colonna, 35
33170 Pordenone (IT)

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Description

[0001] The present invention relates to an apparatus for cutting cardboard panels into strips to be used in the packaging sector. In particular, the invention is related to an apparatus which makes it possible to cut any corrugated cardboard panel into strips of any dimension in a precise and efficient manner, avoiding at the same time the production of dross and dust residues which collect into the corrugations of the same panels.

PRIOR ART TECHNIQUE

[0002] In the packaging sector, it has long been known the use of the so-called "filling" materials which can ensure the integrity of the packaged item during the operations of moving the item to warehouses, during its loading, transport and unloading from vehicles. These materials are largely used in the furniture sector to protect pieces of furniture or parts of pieces of furniture such as furniture doors, doors, shelves, ledges, accessories and ornaments.

[0003] A widely used material is polystyrene in the form of pellets or strips or panels of various dimensions.

[0004] However, polystyrene needs differentiated disposal and absolutely it is not an eco-friendly material.

[0005] Those who operate in the large-scale retail trade have long been requiring the suppliers to replace polystyrene with eco-friendly materials.

[0006] The eco-friendly material *par excellence* is cardboard. In fact, thanks to its corrugated structure and to its natural origin, cardboard meets both strength requirements necessary to ensure a very good functionality as a filler, and environmental requirements as it clearly derives from vegetal fibers.

[0007] The methods known at present for making strips from corrugated cardboard panels consist in using apparatuses provided with rotating or band blades. The use of such blades though involves two important technical problems.

[0008] First of all, the blades are made with teeth which, while cutting, produce a product dross of 2-4 mm. Such dross is little important if singularly considered, but it becomes a great waste of material if, as it normally occurs, a panel of great dimensions is cut simultaneously by numerous blades to produce several strips at the same time. In fact, it is to keep in mind that mainly in the production of thin strips (15-20 mm thickness) dross highly affects the finished product yield margins which are extremely reduced with respect to the cost of the raw material.

[0009] Moreover, dross, due to the blade teeth shape, turns into a great amount of dust which wedges and gathers into the corrugations of the strips. It is, therefore, necessary to make the strips undergo a further processing by means of machinery which can ensure a deep cleaning of the corrugations through blowing or suction of dusts. In fact, cleaning is fundamental in order to provide a correct use of the strips and without any inconveniences; such as no dust both in the packaging station and inside the package itself; no scratches caused by the same dust on particularly delicate items, as well as no need for carefully cleaning the items from the same dust.

[0010] Document DE 1628911 discloses a machine for cutting flat workpieces of wood comprising a moving system of one or more of said workpieces along a horizontal plane, a supporting structure for a gatter of cutting tools and a motor for moving said one or more cutting tools, wherein said supporting structure for said cutting tools comprises a frame for bearing blades, which frame is mounted onto a supporting structure to allow alternatively sliding in one direction and in the opposite one of a plurality of blades.

SUMMARY OF THE INVENTION

[0011] The technical problem at the basis of the present invention is therefore that of providing an apparatus capable of avoiding dross production and its transformation into dust gathering in the corrugations of the cardboard strips for packaging.

[0012] Such problem is solved by an apparatus provided with a system for cutting corrugated cardboard panels made so as to obtain strips of any dimension, and from any type of corrugated cardboard, basically without dross and dust inside the corrugations.

[0013] A first object of the invention is then an apparatus for cutting corrugated cardboard panels into strips, as defined in claim 1.

[0014] A further object of the invention is a method for cutting corrugated cardboard panels as defined in claim 13.

BRIEF DESCRIPTION OF FIGURES

[0015] Further characteristics and advantages of the apparatus of the invention will become more apparent from the following description of a form of embodiment given for exemplification only but not limited to with reference to the following figures, wherein:

- figure 1 shows a schematic plan view of a plant for the production of corrugated cardboard strips according to the present invention;
- figure 2 shows a schematic perspective view of a device for moving forward corrugated panels of the apparatus for cutting corrugated cardboard panels according to the invention;
- figure 3 shows a perspective view of the apparatus for cutting corrugated cardboard panels according to the invention;
- figure 4 shows a perspective view of a particular of the apparatus of figure 3;
- figure 5 shows a perspective view of a device for fixing blades, disassembled from the apparatus of figure 3;
- figure 6A and 6B show a front view and a side view

of a blade of the apparatus of figure 3;
- figure 7 shows a perspective view of the cutting system of the apparatus of figure 3;
- figure 8 shows a schematic perspective side view of the cutting system of the apparatus of figure 3 in operating condition;
- figure 9 shows a perspective front view of a particular of the system of figure 8;
- figure 10 shows a perspective side view of the cutting system of figure 8 with a device for moving away the cut strips.

DETAILED DESCRIPTION OF THE INVENTION

[0016] In figure 1, it is shown a schematic plan view of a plant 100 for making strips of corrugated cardboard. The plant 100 comprises an apparatus 1 for cutting strips of corrugated cardboard provided with an entrance I of a corrugated cardboard panel and an exit O of corrugated cardboard strips after the transit of the panel in the apparatus 1.

[0017] The apparatus 1, in its turn, comprises a moving system 2 (shown in figure 2) for one or more corrugated cardboard panels P, a plurality of blades 3 of the cutter type mounted on a frame 4, a supporting structure 5 of said frame 4 of the blades 3 (figure 3).

[0018] In particular, as shown in figure 2, the moving system comprises a couple of conveyor belts 2 apt at receiving a corrugated cardboard panel P in the entrance area I of the apparatus 1 and move it forward, that is in the opposed direction with respect to the entrance I, compacting it sandwich-like on both its two faces.

[0019] In accordance with a first aspect of the invention, the frame 4 (figure 3) is a supporting structure which advantageously carries cutter type blades 3 and is made of a sort of castle comprising two horizontal and parallel crossbeams 41 A and 41 B and connected one to the other to the respective ends by means of corresponding uprights 42. In this way, it is formed a sort of rectangle defining a space occupied by the blade guides, as later described.

[0020] Advantageously, it is to note that the frame 4, in turn, is slidably mounted onto the supporting structure 5. The supporting structure 5, in fact, comprises a bridge 51 integral with a base 52, the latter anchored to the ground, preferably onto a concrete pour. On the base 52 it is fixed an electric motor 6 connected to an eccentric shaft 7 through a conventional transmission (not shown). The ends of the eccentric shaft 7 are connected to a connecting rod 8, which is then fixed to said upright 42 of the frame 4. In particular, the frame 4 is slidably mounted onto guides 53 fixed on the uprights of the bridge 51 so as to allow the moving forwards and backwards of the same frame towards one direction or towards the opposite direction.

Surprisingly, it has been found that the use of the cutter type moved by means of the above said frame has made it possible to considerably reduce the above said problem of dross and of dust entering the cardboard corrugations.

[0021] In accordance with a preferred embodiment of the invention (as well shown in figures 8 and 10), the frame 4 is mounted onto said supporting structure 5 in an inclined position with respect to its base 52 (shown in figure 3). Consequently, the movement forwards and backwards towards alternate opposite directions advantageously indeed occurs on an inclined plane with respect to the base. In other words, the frame 4 moves on a plane which is inclined with respect to the moving plane of the panel P, as later explained in detail. It has been seen that the blade inclination makes it possible to further reduce the amount of dross produced so as to basically eliminate it, as well as the problem of dust in the corrugations.

[0022] Preferably, the frame 4 is inclined of an angle comprised between 30° and 60° with respect to the moving plane of the panel P. In fact, following experimentations it has been found that this inclination degree allows the best cutting angle which reduces the stress and wearing out the blades 3 undergo and, therefore, it is advantageously increased their operating life.

[0023] With reference to figure 4, it is shown a fixing device 10 of the blades 3 to the frame 4. In particular, the device 10 comprises a first fixing element 11 and a second fixing element 12.

[0024] The first fixing element 11 comprises a first fixing portion 111 to the upper crossbeam 41 A of the frame 4 and a second portion 112 for engagement with a first end of a blade 3, as later described. Preferably, the first portion 111 is a longitudinal piece provided with two holes 113 for fixing with screws and nuts (not shown) to said crossbeam 41 A. The second portion 112 is T connected to the first portion and comprises a pin 114 for engagement with said first end of the blade 3. Preferably, this pin 114 can be placed in at least two not aligned positions with respect to the longitudinal extension of said second portion.

[0025] The second element 12 is T-shaped basically similar to that of the first element 11, that is, it comprises a first portion 121 for fixing to the lower crossbeam 41 B and a second portion 122 for engagement with a second end of the blade 3. Preferably, the first portion 121 is provided with two through holes 123 for fixing to said crossbeam 41 B by means of screws and nuts. Further, it is preferably provided with a further hole engaged by a tensioning element 15 of the blade 3. The second portion 122 is longitudinally crossed by an inner groove 124 connected to said further hole.

[0026] The tensioning element has a central body 151 apt at engaging said inner groove 124, a first end 152 protruding from said second portion 122 of the second element 12 and a second end 153 protruding from said first portion 121 still of the said second element 12. The first end 152 has a flat head carrying a pin 154 for connecting to a second end of the blade 3. Preferably, said flat head has a surface extended enough so as to allow to place the pin 154 in at least two different not aligned

positions with respect to the longitudinal extension of said tensioning element.

[0027] On the contrary, the second end 153 comprises a threaded portion 155 whereon a nut 156 is screwed or unscrewed which makes it possible to adjust the blade 3 tensioning. In fact, the nut screwing causes the tensioning element to move, and therefore also of the first end 152 connected to the blade 3, in the traction direction of the same blade. On the contrary, unscrewing causes the traction release.

[0028] Preferably, between the nut 156 and the first portion 121 of the second element 12 of the fixing device 10 there is interposed a sleeve 157 provided with an elastic element, such as a spring, having the function of ensuring the correct tensioning of the blade and of absorbing possible side or transverse excess loads.

[0029] In accordance with a preferred form of embodiment of the invention, the fixing device 10 of the blades 3 comprises guiding means apt at keeping each blade along a single straight line during the cutting operation.

[0030] To this purpose, the apparatus 1 also comprises a supporting structure 9 for the above said guiding elements 13, 14 of blades 3. This structure 9 (figure 3) is preferably composed of a first element 91 and of a second element 92. The first element 91 is a sort of table, fixed to the ground or to the base 52, whereon it is made to slide the panel P coming from the entrance I of the apparatus 1. One edge 911 of such table is placed in the space defined by the frame 4 and has a housing seat 912 for the first element 13 of said guiding means. Preferably, said seat is shaped step-like, as better shown in figure 5.

[0031] The second element 92 is a sort of bar extending horizontally between the uprights of the bridge 52 and fixed to them. In particular, the bar is positioned on the upper part and at a certain distance from the edge 911 of the first element 91. In this position, the bar 92 and the edge 911 are basically aligned along the vertical (axis) so as to practically be in the space defined by the frame 4. Moreover, this bar 92 comprises a track 913 (shown in figure 5) whereon the second element 14 of said guiding elements are mounted. Preferably, each end of the bar 92 is connected to the uprights of the bridge 51 by means of a sliding guide (not shown) operated by a manual or automated mechanism in order to make it possible its moving away or close with respect to the edge 911 of the table 91 of the structure 9. Such mechanism is, for example, formed by a screw 914 manually operated by a rod 915 (figure 5).

[0032] It is to note that the just described mechanism makes it possible to keep the panel pressed while cutting so as to avoid movements which can cause an imperfect cut (for example not rectilinear) and/or formation of folds (Figure 8).

[0033] As shown in figure 4, the guiding elements are, for example, a first 13 and a second 14 guiding element. The first guiding element 13 is provided with an anchoring portion 131 to the edge 911 of the table 91 of the support 9 of the guiding elements and a guiding portion 132 of the blade 3. Preferably, the anchoring portion 131 comprises a groove 133 for the engagement to a corner (not shown) of the seat 911 of the edge 91 and clamping elements 134 to anchor said first guiding element on said edge 91. These clamping elements 134 are formed by, for example, a plate provided with an engaging tooth, mounted on a screw provided with a nut so as to make it possible to adjust the plate blocking on a further corner (not shown) of the edge 91.

[0034] Preferably, the guiding portion 132 consists of two plates fixed to the anchoring portion 131 so as to define a groove 135 which is slidably engaged by a blade 3.

[0035] Similarly, the second guiding element 14 comprises an anchoring portion 141 to the bar 92 of the supporting structure 9 of the guiding means and a guiding portion 142 of a blade 3. Preferably, the anchoring portion 141 comprises a groove 143 for engagement with a corner (not shown) of the bar 92 and clamping means 144 for anchoring said second guiding element onto said bar 92. These clamping means 144 consist of, for example, a plate, provided with a engaging tooth, mounted on a screw provided with a nut so as to make it possible to adjust the plate blocking on a further corner (not shown) of the bar 92.

[0036] Preferably, the guiding portion 142 consists of two plates fixed to the anchoring portion 141 so as to define a groove 145 which is slidably engaged by a blade 3.

[0037] With reference to figures 6A and 6B, the reference number 3 is referred to a blade of cutter type used in the apparatus 1 according to the present invention. In particular, the cutter blade 3 is a metal band having a longitudinal edge 31 whose transverse profile has a gradual thinning up ending in a point (figure 6B). Further, longitudinally, said profile 31 has an undulating form with pointed apexes of the flutes. Preferably, the bending radius of the flutes is comprised between 10 mm and 50 mm and the apex height is comprised between 3 mm and 5 mm. The maximum thickness of the blades is not higher than 0.9 mm, preferably it is between 0.5 mm and 0.8 mm. It results that the dross produced is practically reduced to zero.

[0038] Such blades are preferably made of metal, preferably steel having a surface hardening treatment. It has been seen that this particular combination of the cutter blade characteristics makes it possible to fully reduce the formation of dust while cutting and at the same time, its wearing out with an operation life of more than 40 hours. Further, each of the blade ends has a hole 32 for engaging respectively with the pin 114 and 154 of the first 11 and second 12 fixing element of the blade to the frame 4 (figure 4).

[0039] In accordance with a preferred embodiment of the invention, the blades 3 are mounted on the frame 4 so as not to be aligned, in other words staged with respect to the cutting plane. In particular as shown in the detail

of figure 7, adjacent blades are positioned onto two parallel but not aligned planes, one lower and the other higher, that is one nearer to the base 52 of the supporting structure 5 of the frame 4 and the other farther. This particular arrangement is obtained thanks to the different anchoring position of the blade 3 ends respectively on the first element 11 and the second element 12 of the fixing device 10 to the frame 4, thanks to the possibility of varying the position of pins 114 and 154 with respect to the longitudinal extension of the respective first element 11 and second element 12.

[0040] Moreover, in accordance with the present invention the plant 100 preferably comprises a couple of motored conveyor belts 16 (figure 10) placed in the proximity of the exit O of the apparatus 1 for cutting strips. These rolls 16 have the function of taking the just cut strips and, keeping them "sandwich" pressed, moving them forward to an unloading area of the plant 100. Hence, advantageously, the strips exiting the apparatus 1 remain compact and do not undergo folds.

[0041] In accordance with a second object of the invention it will now be described a method for cutting corrugated cardboard strips, as defined in claim 13.

[0042] In accordance with a particularly preferred embodiment of the invention, the moving step occurs forwards and backwards along a plane inclined with respect to the horizontal moving forward plane of said panels.

[0043] In particular, the corrugated cardboards provided can be of any shape, length, breadth and thickness traditionally on the market. For example, they can be multilayered cardboards with a minimum thickness of 3 mm. The structure of the corrugations can be any of the known in the field, such as open flute, or for all kinds of available flutes: flute B (total cardboard thickness 3.0 mm), flute C (total cardboard 4.0 mm), flute EB (total cardboard 4.5 mm), flute BC (total cardboard 6.2 mm), flute CC (total cardboard 8.0 mm), flute AA (total cardboard 8.5 mm), as well as all undulating types of cardboard, 1, 2 or 3 fluted walls according to the FEFCO international classification. For example their breadth can vary from a minimum of 100 mm up to 1250 mm, while the height of a single cardboard or of a pack of cardboards can be for example up to a maximum of 150 mm.

[0044] The moving forward step is carried out keeping the cardboard sandwich pressed, such as shown in figure 2. The moving forward speed is comprised between 0.5 m per minute and 5 m per minute.

[0045] The plurality of cutter blades is moved according to the above said alternate movement at a frequency comprised between 10 swing/second and 30 swing/second. Further, according to the preferred embodiment, as previously described, the inclination of the blades, and thus of the cut, with respect to the horizontal plane of the corrugated cardboard panel is comprised between 30° and 60°, as shown in figure 8.

[0046] As previously described, the cutting step is preferably carried out positioning adjacent blades staged and separated one to the other in a variable manner along a longitudinal line, as shown in figure 9.

[0047] The method preferably also comprises a collecting step of the cut strips by moving forward and, at the same time, sandwich pressing the strips exiting the cutting step. Such collecting step is preferably carried out, as shown in figure 10, by means of a motored conveyor belts.

[0048] From the foregoing it is apparent that the inconveniences of the known art have been solved and important advantages have been achieved.

[0049] First of all, the apparatus and the method according to the invention make it possible to fully reduce the dross produced with traditional apparatuses provided with rotating or band blades and hence the waste of material. This entails a great saving in terms of material. At the same time, it is avoided the consequent cleaning of the dust which gathers in the corrugations of the strips.

[0050] The pitch between the single blades is variable thanks to the possibility of mounting the respective supporting devices singularly along corresponding longitudinal structures. In this way, it is possible to contemporarily make strips of different width on the same panel. It is clear that this solution allows the greatest flexibility of the machine tooling and the optimization of the panel exploitation.

[0051] The frame 4 of the blades makes it possible to adjust their inclination with respect to the horizontal plane so as to adapt the blade cutting capacity to the corrugated panel structure.

[0052] The possibility of staging the blades one from the other makes it possible to improve their penetrating effect on the pack of panels, that is to reduce the load generated on the blades as they are not contemporarily involved in the incoming panel to be cut.

[0053] It is possible to independently adjust the tensioning of each blade thanks to the particular make of the fixing device 10 of the blades.

[0054] Similarly, it is possible to independently adjust the staged position of the blades.

[0055] Through the adjustment of the distance between the first element 13 and the second element 14 of the guiding means of the blades it is possible to adjust the pressure in correspondence with the cutting point of the panel so as to avoid its moving which can hinder the precision of the same cut. Moreover, this adjustment allows to adapt the cutting method to any thickness of the cardboard or of more stacked panels to be cut.

[0056] It can now be seen that according to the thickness, the number and the corrugation structure of the panels, the apparatus is capable of independently adjusting the moving forward speed of the panel to be cut, the swing frequency of the blades, the pitch of the blades, the distance between the first guiding element 13 and the second guiding element 14, the blade tensioning, all in order to optimize the cutting method. Practically, if the thickness and/or the corrugation structure are respectively thin and wide then the moving forward speed will be high and the swing frequency of the blades will be

low. The contrary will occur when the thickness and/or the corrugation structure will be respectively high and narrow.

[0057] It is to bear in mind that many variants can be made to the apparatus and method of the present invention without exiting its protection field as defined by the appended claims.

[0058] For example, the force for moving the frame 4 of the blades can be obtained by non electric motors but internal combustion motors, or with mechanical vibration systems, ultrasound, magnetic induction motors, etc.

[0059] The adjustment of the distance between the guiding elements 13 and 14 can occur electromechanically rather than manually.

[0060] A control and command panel of the members of the device 10 can control and operate singularly said members in order to adjust their operation according to the specific cutting conditions. For example, operating and controlling the synchronous moving forward speed of the corrugated cardboard panel incoming and exiting the cutting apparatus 1, operating and controlling the swing frequency of the frame independently from the moving forward speed of the cardboard.

[0061] The guiding elements 13 and 14 can have the guiding portion made *en bloc* milled so as to obtain the housing groove of the blade 3. Moreover, these same guiding elements can be fixed to the respective supports by means of traditional screws and nuts rather than plates with crimping teeth.

[0062] The dimensions and the materials of the devices and of the elements of the apparatus according to the present invention can vary depending on particular requirements or preferences. For example, the thickness of each component of the fixing device 10 of the blades can be reduced to the purpose of mounting a greater number of blades 3 on the frame 4 and of being able to cut out of a single panel both a greater number of strips and a lower width for each strip.

[0063] The plant 100 can further comprise a station for manually or automatically loading the cardboards to be cut for example taking them from a storage pallet. The loading can be automated so as to select the type and number of panels to load both side-by-side and stacked.

[0064] Besides the loading station, it can be provided a station for the transverse sectioning of the panel before cutting it into strips in order to determine their final length.

[0065] At the exit of the strips cut by the apparatus 1 there can be a machine for collecting and stacking the strips at the side of the plant in order to carry out their storage.

[0066] At the exit of the strips stacked in the machine of said collecting machine, there can be installed an automated or manual taping machine for the binding or strapping of the bundle of strips.

[0067] In turn, the bundles of bound or strapped strips can go into a cutting machine for the right length sectioning of the strips.

Claims

1. Apparatus (1) for cutting corrugated cardboard panels (P), comprising a moving system (2) of one or more of said panels (P) along a horizontal plane, a supporting structure (4) with one or more cutting tools (3) and a motor (6) for moving said one or more cutting tools, **characterized in that** said supporting structure (4) with said cutting tools comprises a frame (4) bearing blades (3), which frame (4) is mounted onto a supporting structure (5) to allow alternatively sliding in one direction and in the opposite one of a plurality of blades (3) of cutter type, said blades (3) having a longitudinal edge (31) whose transverse profile has a gradual thinning up ending in a point, said profile having an undulating form with pointed apexes of the flutes, the bending radius of the flutes being comprised between 3 mm and 5 mm, and the maximum thickness of the blades being not higher than 0.9 mm.

2. Apparatus (1) according to claim 1, wherein said sliding of the frame (4) for bearing blades is carried out backwards and forwards along an inclined plane with respect to the horizontal plane of the system (2) for moving said panels so that said plurality of blades (3) of cutter type carries out an inclined cut with respect to the horizontal plane surface of the panel (P).

3. Apparatus (1) according to claim 1 or 2, wherein said moving system (2) comprises a couple of conveyor belts adapted to carry between them one or more of said panels (P) while exercising a compacting pressure.

4. Apparatus (1) according to any of claim 1 to 3, wherein said frame (4) comprises two parallel and horizontal cross-beams (41 A, 41 B), connected to the respective ends by means of vertically uprights (42), said plurality of blades (3) being mounted between said two cross-beams by means of a fixing device (10).

5. Apparatus (1) according to claim 4, wherein said two cross-beams (41 A, 41 B) of said frame (4) are connected each other to their respective ends by means of uprights (42) vertically inclined, and thus said plurality of blades (3) is arrange between said two cross-beams by means of said fixing device (10) so that the blades are vertically inclined and parallel to each other.

6. Apparatus (1) according to claim 4, wherein said fixing device (10) comprises a first element (11) having a first portion (111) for fixing to the upper cross-beam (41 A) of the frame (4) and a second portion (112) for engagement with a first end of a blade (3), and a second element (12) having a first portion (121) for

fixing to the lower cross-beam (41 B) of the frame (4) and a second portion (122) for engagement with a second end of said blade (3).

7. Apparatus (1) according to claim 6, wherein said second fixing element (12) further comprises a tensioning element (15) of a blade (3).

8. Apparatus (1) according to any one of claims 1 to 7, wherein said structure (5) for supporting said frame (4) comprises a bridge (51) provided with uprights onto which guides (53) allowing said sliding of the frame are fixed.

9. Apparatus (1) according to any one of claims 1 a 8, wherein said frame (4) moves onto said supporting structure (5) along a plane inclined of 30°- 60° with respect to the horizontal moving plane of the panel (P).

10. Apparatus (1) according to any one of claims 1 to 9, further comprising a supporting structure (9) of guiding means (13, 14), said means being adapted to maintain each blade (3) along a straight line during the cutting.

11. Apparatus (1) according to claim 10, wherein said supporting structure (9) comprises a first element (91) for supporting a first guiding element (13) and a second element (92) for supporting a second guiding element (14), the distance between said first (91) and second (92) supporting elements being adjustable to bring close or away said first (13) and second (14) guiding elements.

12. Apparatus (1) according to claim 11, wherein each of said first (13) and second (14) guiding elements comprises an anchoring portion (131; 141) respectively for said second supporting element (92) and first supporting element (91), and a guiding portion (132; 142) provided with a groove (135; 145) for a sliding engagement of said blade (3).

13. Method for cutting corrugated cardboard panels, comprising the steps of:

a) providing one or more corrugated cardboard panels eventually stacked;
b) moving forward said one or more panels onto a horizontal plane towards a plurality of cutter blades while keeping said one or more panels "sandwich" pressed, said blades having a longitudinal edge (31) whose transverse profile has a gradual thinning up ending in a point, said profile having an undulating form with pointed apexes of the flutes, the bending radius of the flutes being comprised between 3 mm and 5 mm, and the maximum thickness of the blades being not higher than 0.9 mm;
c) moving a plurality of cutter blades parallel each other, alternately in one direction and in the opposite one;
d) carrying out a cut of said panel into strips.

14. Method according to claim 13, wherein said step c) of moving a plurality of cutter blades is carried out backwards and forwards along an inclined plane with respect to an horizontal moving plane of said panels.

15. Method according to claim 13 or 14, wherein the moving forward step is carried out keeping the cardboard sandwich pressed, the forward speed is comprised between 0,5 m per minute and 5 m per minute, the plurality of cutter blades is moved according to said alternate movement at a frequency comprised between 10 swing/second and 30 swing/second, the inclination of the blades, and thus of the cut, with respect to the horizontal plane of the corrugated cardboard panel is comprised between 30° e 60°, the cutting step is preferably carried out positioning adjacent blades staged and separated one to the other in a variable manner along a longitudinal cutting line.

Patentansprüche

1. Vorrichtung (1) zum Schneiden von Wellkartonplatten (P), mit einem System zum Transportieren (2) einer oder mehrerer der Platten (P) entlang einer horizontalen Ebene, einer Haltestruktur (4) mit einem oder mehreren Schneidewerkzeugen (3) und einem Motor (6) zum Verschieben des einen oder der mehreren Schneidewerkzeuge, **dadurch gekennzeichnet, dass** die Haltestruktur (4) mit den Schneidewerkzeugen einen Rahmen (4), der Klingen (3) trägt, aufweist, wobei der Rahmen (4) abwechselnd ein Gleiten in einer Richtung und in der entgegengesetzten Richtung von mehreren Klingen (3), die vom Typ einer Schneide sind, ermöglicht, wobei die Klingen (3) eine Längskante (31) aufweisen, deren Querprofil eine graduelle zulaufende Verdünnung hat, die in einem Punkt mündet, wobei das Profil eine gewellte Form mit spitz zulaufenden Scheiteln der Rillen aufweist, wobei der Biegeradius der Rillen zwischen 3 mm und 5 mm liegt und wobei die maximale Dicke der Klingen nicht größer als 0,9 mm ist.

2. Vorrichtung (1) nach Anspruch 1, wobei das Gleiten des Rahmens (4) zum Tragen der Klingen rückwärts und vorwärts entlang einer geneigten Ebene in Bezug auf die horizontale Ebene des Systems (2) ausgeführt wird, um die Platten so zu transportieren, dass die mehreren Klingen (3) des Schneidetyps einen geneigten Schnitt in Bezug auf die horizontale

Ebenenfläche der Platte (P) ausführen.

3. Vorrichtung (1) nach Anspruch 1 oder 2, wobei das Transportsystem (2) mehrere Transportbänder aufweist, die ausgebildet sind, zwischen ihnen eine oder mehrere der Platten (P) zu transportieren, während ein Verdichtungsdruck ausgeübt wird.

4. Vorrichtung (1) nach einem der Ansprüche 1 bis 3, wobei der Rahmen (4) zwei parallele und horizontale Querstreben (41 A, 41 B) aufweist, die mit jeweiligen Enden mittels vertikaler Säulen (42) verbunden sind, wobei die mehreren Klingen (3) zwischen den zwei Querstreben mittels einer Befestigungseinrichtung (10) montiert sind.

5. Vorrichtung (1) nach Anspruch 4, wobei die beiden Querstreben (41 A, 41 B) des Rahmens (4) über ihre jeweiligen Enden mittels Säulen (42), die vertikal geneigt sind, miteinander verbunden sind, und somit die mehreren Klingen (3) zwischen den zwei Querstreben mittels der Befestigungseinrichtung (10) so angeordnet sind, dass die Klingen vertikal geneigt und parallel zueinander sind.

6. Vorrichtung (1) nach Anspruch 4, wobei die Befestigungseinrichtung (10) ein erstes Element (11) mit einem ersten Teil (111) zur Befestigung an der oberen Querstrebe (41 A) des Rahmens (4) und mit einem zweiten Teil (112) zum Eingriff mit einem ersten Ende einer Klinge (3) und ein zweites Element (12) mit einem ersten Teil (121) zur Befestigung an der unteren Querstrebe (41 B) des Rahmens (4) und mit einem zweiten Teil (122) zum Eingriff in ein zweites Ende der Klinge (3) aufweist.

7. Vorrichtung (1) nach Anspruch 6, wobei das zweite Befestigungselement (12) ferner ein Spannelement (15) einer Klinge (3) aufweist.

8. Vorrichtung (1) nach einem der Ansprüche 1 bis 7, wobei die Struktur (5) zum Halten des Rahmens (4) eine Brücke (51) aufweist, die mit Pfosten versehen ist, auf denen Führungen (53) befestigt sind, die das Gleiten des Rahmens ermöglichen.

9. Vorrichtung (1) nach einem der Ansprüche 1 bis 8, wobei der Rahmen (4) sich auf der Haltestruktur (5) entlang einer Ebene bewegt, die 30° bis 60° in Bezug auf die horizontale Bewegungsebene der Platte (P) geneigt ist.

10. Vorrichtung (1) nach einem der Ansprüche 1 bis 9, die ferner eine Haltestruktur (9) aus Führungseinrichtungen (13, 14) aufweist, wobei die Einrichtungen ausgebildet sind, jede Klinge (3) während des Schneidens entlang einer geraden Linie zu halten.

11. Vorrichtung (1) nach Anspruch 10, wobei die Haltestruktur (9) ein erstes Element (91) zum Halten eines ersten Führungselements (13) und ein zweites Element (92) zum Halten eines zweiten Führungselements (14) aufweist, wobei der Abstand zwischen dem ersten (91) und dem zweiten (92) Halteelement verstellbar ist, um das erste (13) und das zweite (14) Führungselement einander anzunähern oder voneinander zu entfernen.

12. Vorrichtung (1) nach Anspruch 11, wobei das erste (13) und das zweite (14) Führungselement jeweils einen Ankerbereich (131; 141) entsprechend für das zweite Halteelement (92) und das erste Halteelement (91) aufweisen, und wobei ein Führungsbereich (132; 142) mit einer Nut (135; 145) für einen gleitenden Eingriff der Klinge (3) versehen ist.

13. Verfahren zum Schneiden von Wellkartonplatten, mit den Schritten:

a) Bereitstellen einer oder mehrerer Wellkartonplatten, die letztlich gestapelt sind;
b) Transportieren der einen oder mehreren Platten auf einer horizontalen Ebene nach vorne in Richtung zu mehreren Schneideklingen, wobei die eine oder die mehreren Platten durch Druck als Schichtanordnung beibehalten werden, wobei die Klingen eine Längskante (31) aufweisen, deren Querprofil eine graduelle zulaufende Verdünnung hat, die in einem Punkt mündet, wobei das Profil eine Wellenform mit spitz zulaufenden Scheiteln der Rillen aufweist, wobei der Biegeradius zwischen 3 mm und 5 mm liegt und die maximale Dicke der Klingen nicht größer als 0,9 mm ist;
c) Transportieren mehrerer Schneideklingen parallel zueinander abwechselnd in eine Richtung und in die entgegengesetzte Richtung;
d) Schneiden der Platte zu Streifen.

14. Verfahren nach Anspruch 13, wobei der Schritt c) des Transportierens mehrerer Schneideklingen vorwärts und rückwärts entlang einer geneigten Ebene in Bezug auf eine horizontale Bewegungsebene der Platten ausgeführt wird.

15. Verfahren nach Anspruch 13 oder 14, wobei der Schritt des Transports nach vorne ausgeführt wird, während der Kanton durch Pressen als Schichtverbund beibehalten wird, wobei die Vorwärtsgeschwindigkeit zwischen 0,5 m pro Minute und 5 m pro Minute liegt, wobei die mehreren Schneideklingen entsprechend der abwechselnden Transportbewegung mit einer Frequenz zwischen 10 Schwingungen/Sekunde und 30 Schwingungen/Sekunde bewegt werden, wobei die Neigung der Klingen und somit des Schnitts in Bezug auf die horizontale Ebe-

ne der Kartonplatte zwischen 30° und 60° liegt, wobei der Schneideschritt vorzugsweise ausgeführt wird, indem benachbarte Klingen gestuft und getrennt voneinander in variabler Weise entlang einer Schneidelinienlängsrichtung positioniert werden.

Revendications

1. Dispositif (1) pour la découpe de panneaux en carton ondulé (P), comprenant un système de déplacement (2) de un ou plusieurs desdits panneaux (P) le long d'un plan horizontal, une structure de support (4) avec un ou plusieurs outils de coupe (3) et un moteur (6) pour déplacer lesdits un ou plusieurs outils de coupe, **caractérisé en ce que** ladite structure de support (4) avec ledit outil de coupe comprend un châssis (4) de support de lames (3), lequel châssis (4) est monté sur une structure de support (5) pour permettre le glissement en alternance dans une direction et dans la direction opposée d'une pluralité de lames (3) de type cutter, lesdites lames (3) ayant un bord longitudinal (31) dont le profil transversal a un amincissement progressif se terminant par un point, ledit profil ayant une forme ondulée avec un sommet pointu au niveau de cannelures, le rayon de courbure des cannelures étant compris entre 3 mm et 5 mm, et l'épaisseur maximale des lames n'étant pas supérieure à 0,9 mm.

2. Dispositif (1) selon la revendication 1, dans lequel ledit déplacement du châssis (4) de support de lames est effectué vers l'arrière et vers l'avant le long d'un plan incliné par rapport au plan horizontal du système (2) pour déplacer lesdits panneaux de sorte que ladite pluralité de lames (3) de type cutter effectue une coupe inclinée par rapport à la surface du plan horizontal du panneau (P).

3. Dispositif (1) selon la revendication 1 ou 2, dans lequel ledit système de déplacement (2) comprend un couple de courroies de convoyage adaptées pour transporter entre elles un ou plusieurs desdits panneaux (P) tout en exerçant une pression de compactage.

4. Dispositif (1) selon l'une des revendications 1 à 3, dans lequel ledit châssis (4) comprend deux traverses parallèles et horizontales (41A, 41B), connectées aux extrémités respectives au moyen de montants verticaux (42), ladite pluralité de lames (3) étant montée entre lesdites deux traverses au moyen d'un dispositif de fixation (10).

5. Dispositif (1) selon revendication 4, dans lequel lesdites deux traverses (41A, 41B) dudit châssis (4) sont liées entre elles par leurs extrémités respectives au moyen des montants (42) inclinés verticalement, et ainsi ladite pluralité de lames (3) est agencée entre lesdites traverses au moyen dudit dispositif de fixation (10) de sorte que les lames sont inclinées verticalement et parallèlement les unes aux autres.

6. Dispositif (1) selon la revendication 4, dans lequel ledit dispositif de fixation (10) comprend un premier élément (11) ayant une première partie (111) de fixation à la traverse supérieure (41A) du châssis (4) et une seconde partie (112) pour venir en prise avec une première extrémité d'une lame (3), et un deuxième élément (12) ayant une première partie (121) de fixation à la traverse inférieure (41B) du châssis (4) et une seconde partie (122) pour venir en prise avec une seconde extrémité de ladite lame (3).

7. Dispositif (1) selon la revendication 6, dans lequel ledit second élément de fixation (12) comprend en outre un élément de serrage (15) d'une lame (3).

8. Dispositif (1) selon l'une quelconque des revendications 1 à 7, dans lequel ladite structure (5) pour supporter ledit châssis (4) comprend un pont (51) pourvu de montants sur lesquels des guides (53) sont fixés, qui permettent ledit mouvement du châssis.

9. Dispositif (1) selon l'une quelconque des revendications 1 à 8, dans lequel ledit châssis (4) se déplace sur ladite structure de support (5) le long d'un plan incliné de 30° à 60° par rapport au plan de déplacement horizontal du panneau (P).

10. Dispositif (1) selon l'une quelconque des revendications 1 à 9, comprenant en outre une structure de support (9) de moyens de guidage (13, 14), lesdits moyens étant aptes à maintenir chaque lame (3) le long d'une ligne droite au cours de la coupe.

11. Dispositif (1) selon la revendication 10, dans lequel ladite structure de support (9) comprend un premier élément (91) pour supporter un premier élément de guidage (13) et un second élément (92) pour supporter un second élément de guidage (14), la distance entre lesdits premier (91) et second (92) éléments de support étant réglable pour amener à proximité ou à l'écart lesdits premier (13) et second (14) éléments de guidage.

12. Dispositif (1) selon la revendication 11, dans lequel chacun desdits premier (13) et second (14) éléments de guidage comprend une partie d'ancrage (131; 141) respectivement pour lesdits second élément (92) de support et premier l'élément (91) de support, et une partie de guidage (132; 142) pourvue d'une rainure (135; 145) pour un engagement par glissement de ladite lame (3).

13. Procédé pour découper des panneaux en carton on-

dulé, comprenant les étapes consistant en :

a) la fourniture d'un ou plusieurs panneaux en carton ondulé éventuellement empilés ;
b) le déplacement vers l'avant dudit un ou plusieurs panneaux sur un plan horizontal vers une pluralité de lames de coupe tout en maintenant lesdits un ou plusieurs panneaux pressés en "sandwich", lesdites lames ayant un bord longitudinal (31) dont le profil transversal a un amincissement progressif se terminant par un point, ledit profil ayant une forme ondulée avec un sommet pointu au niveau des cannelures, le rayon de courbure des cannelures étant compris entre 3 mm et 5 mm, et l'épaisseur maximale des lames n'étant pas supérieure à 0,9 mm ;
c) le déplacement d'une pluralité de lames de coupe parallèles entre elles, alternativement dans une direction et dans sa direction opposée ;
d) la réalisation d'une découpe en bandes dudit panneau.

14. Procédé selon la revendication 13, dans lequel l'étape c) de déplacement d'une pluralité de lames de coupe est effectuée vers l'arrière et vers l'avant le long d'un plan incliné par rapport à une surface de déplacement horizontal desdits panneaux.

15. Procédé selon la revendication 13 ou 14, dans lequel le mouvement vers l'avant est réalisé en maintenant en sandwich le carton pressé, la vitesse en avant est comprise entre 0,5 m par minute et 5 mètres par minute, la pluralité de lames de coupe est déplacée selon ledit mouvement alternatif à une fréquence comprise entre 10 balancements / seconde et 30 balancements / seconde, l'inclinaison des lames, et donc de la coupe, par rapport au plan horizontal du panneau en carton ondulé est comprise entre 30° et 60°, l'étape de découpe est effectuée de préférence en positionnant des lames adjacentes de façon organisée et séparées l'une de l'autre de façon variable le long d'une ligne de coupe longitudinale.

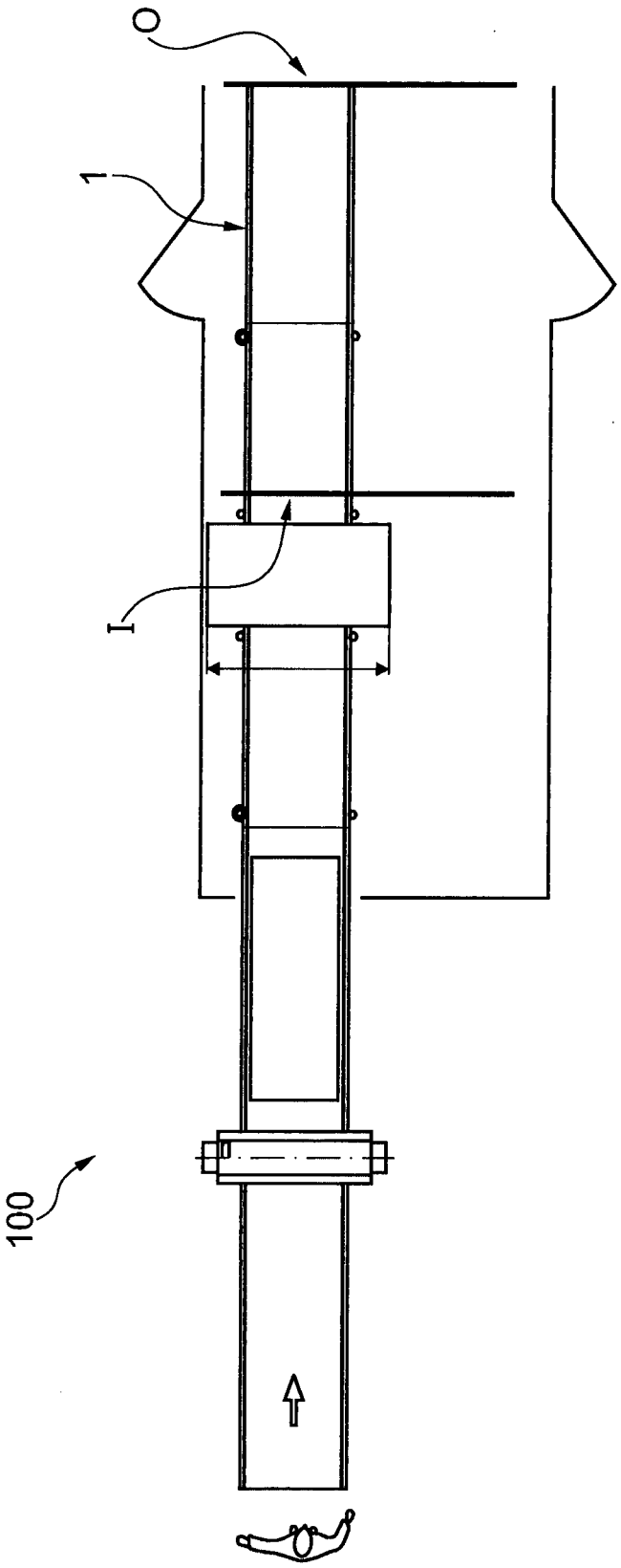

Fig. 1

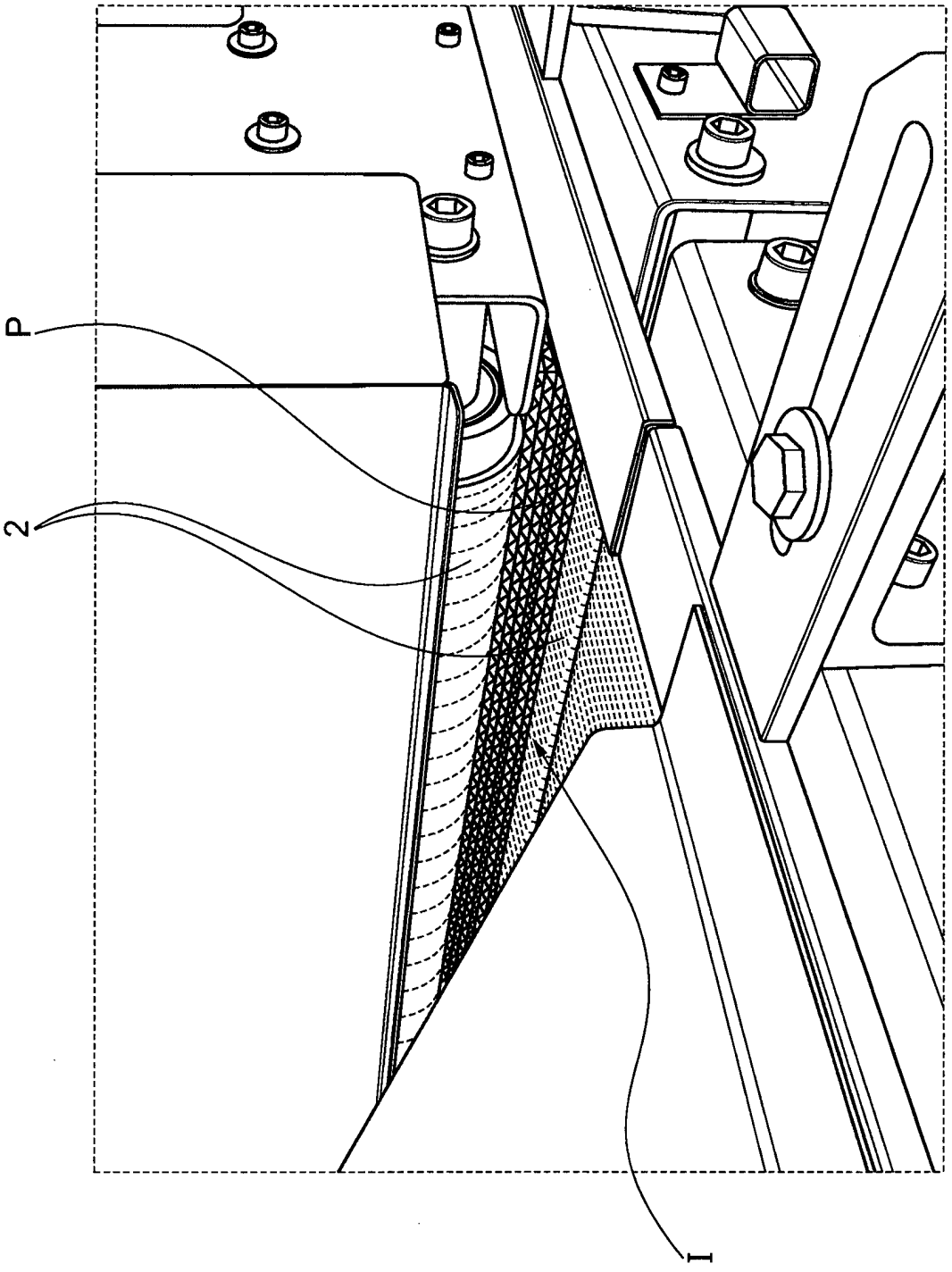

Fig. 2

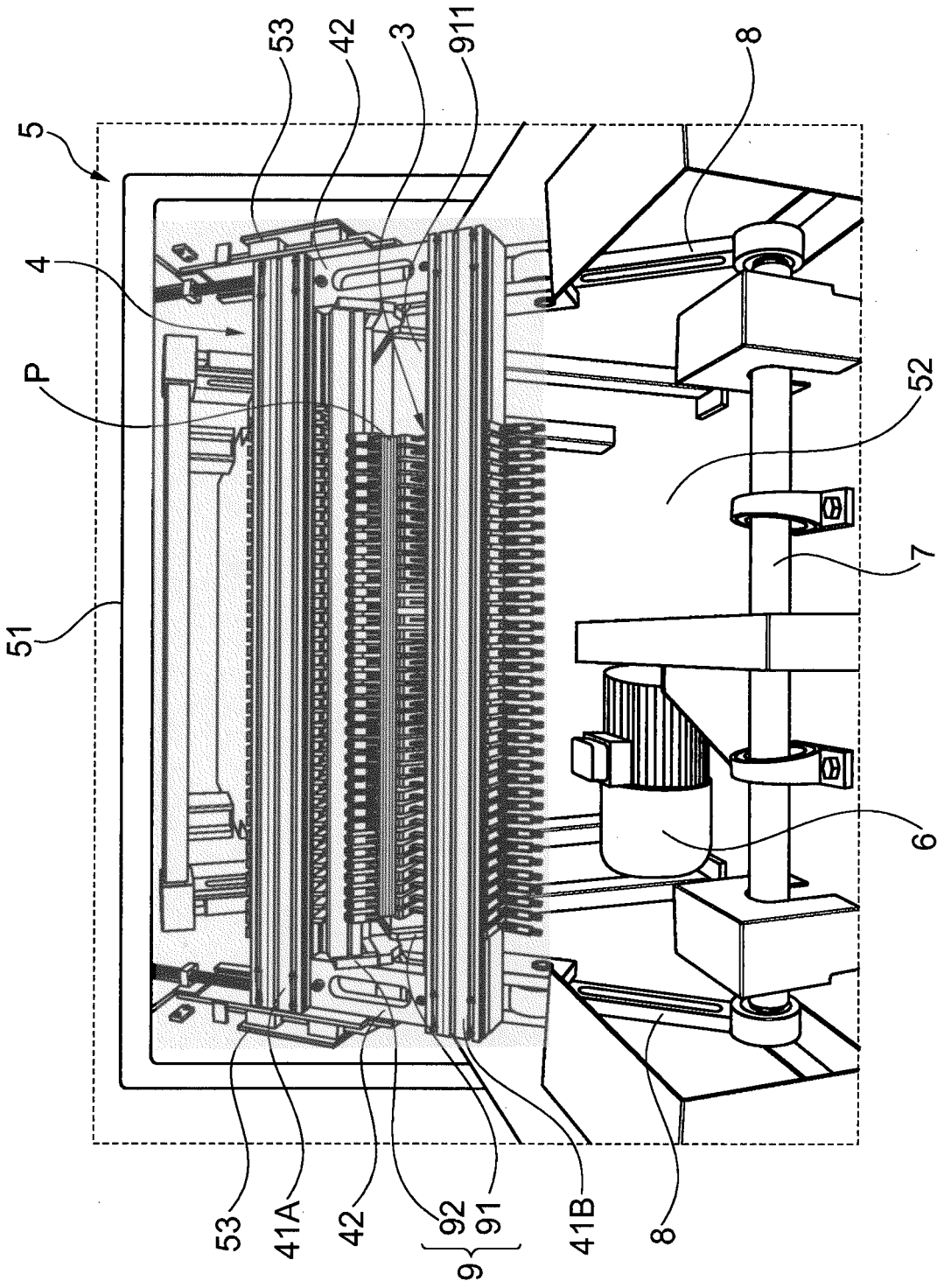

Fig. 3

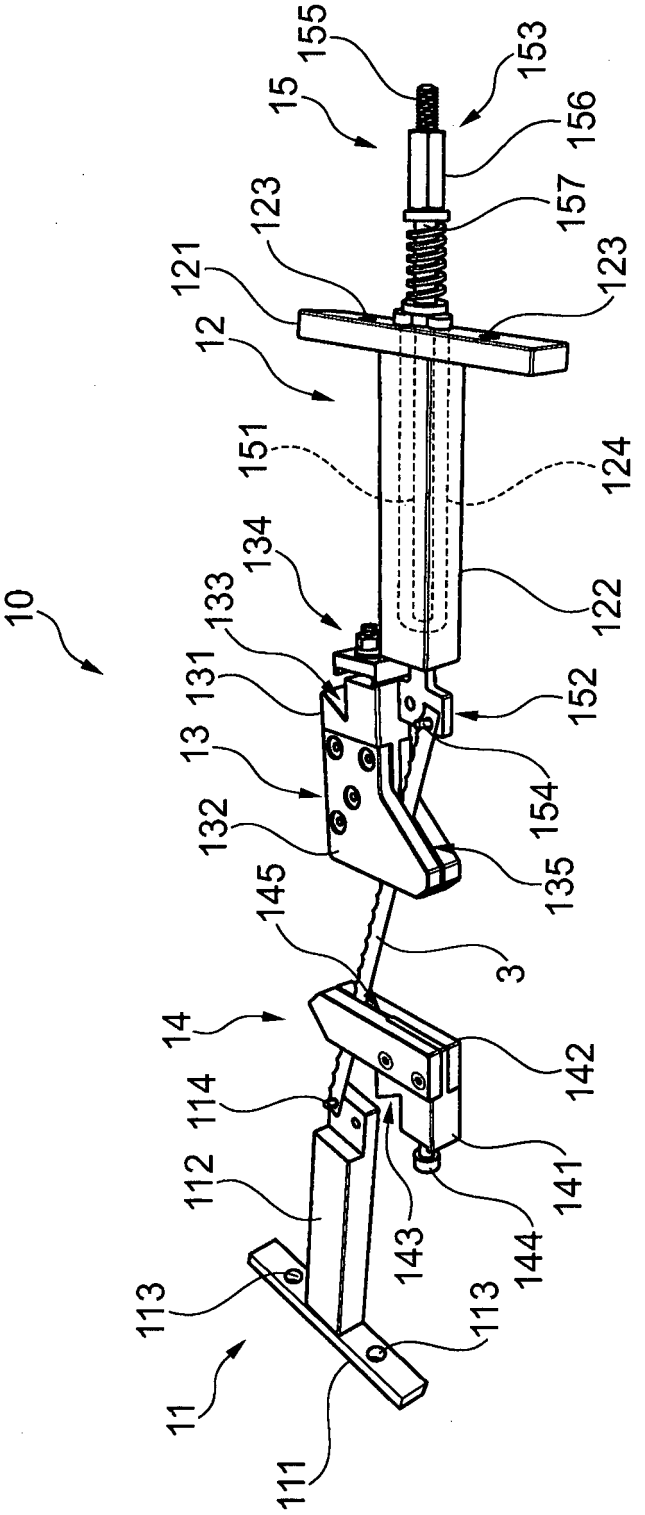
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Fig. 4

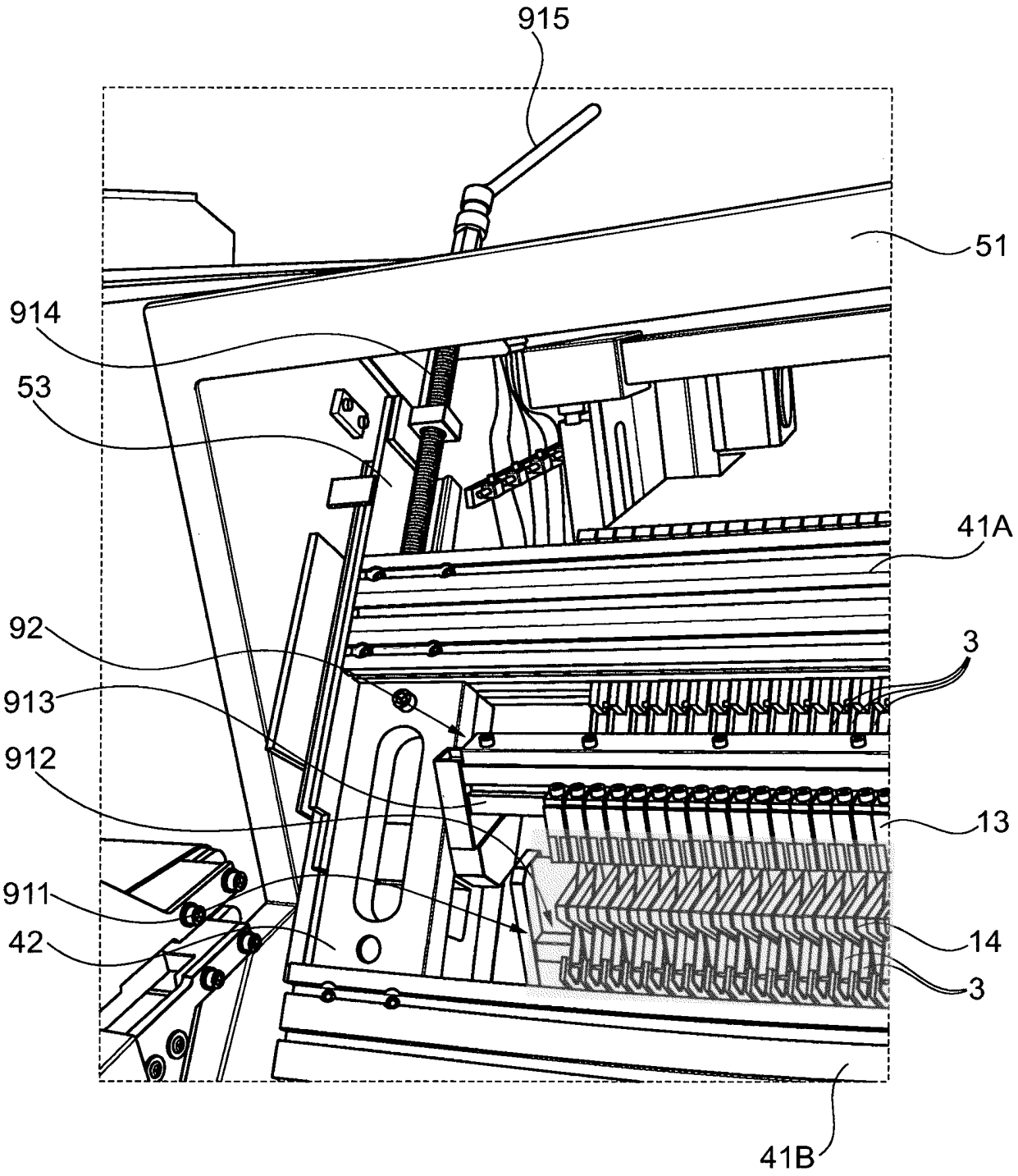

Fig. 5

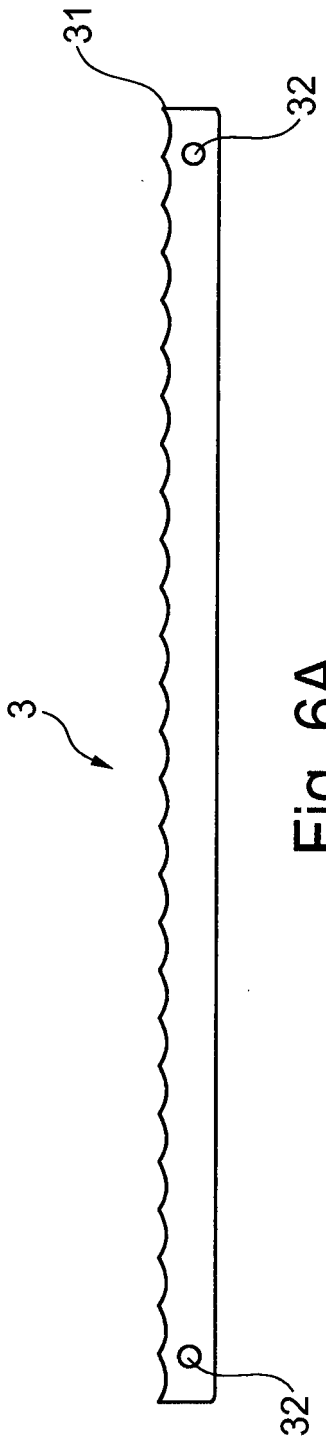

Fig. 6A

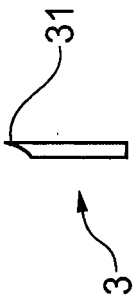

Fig. 6B

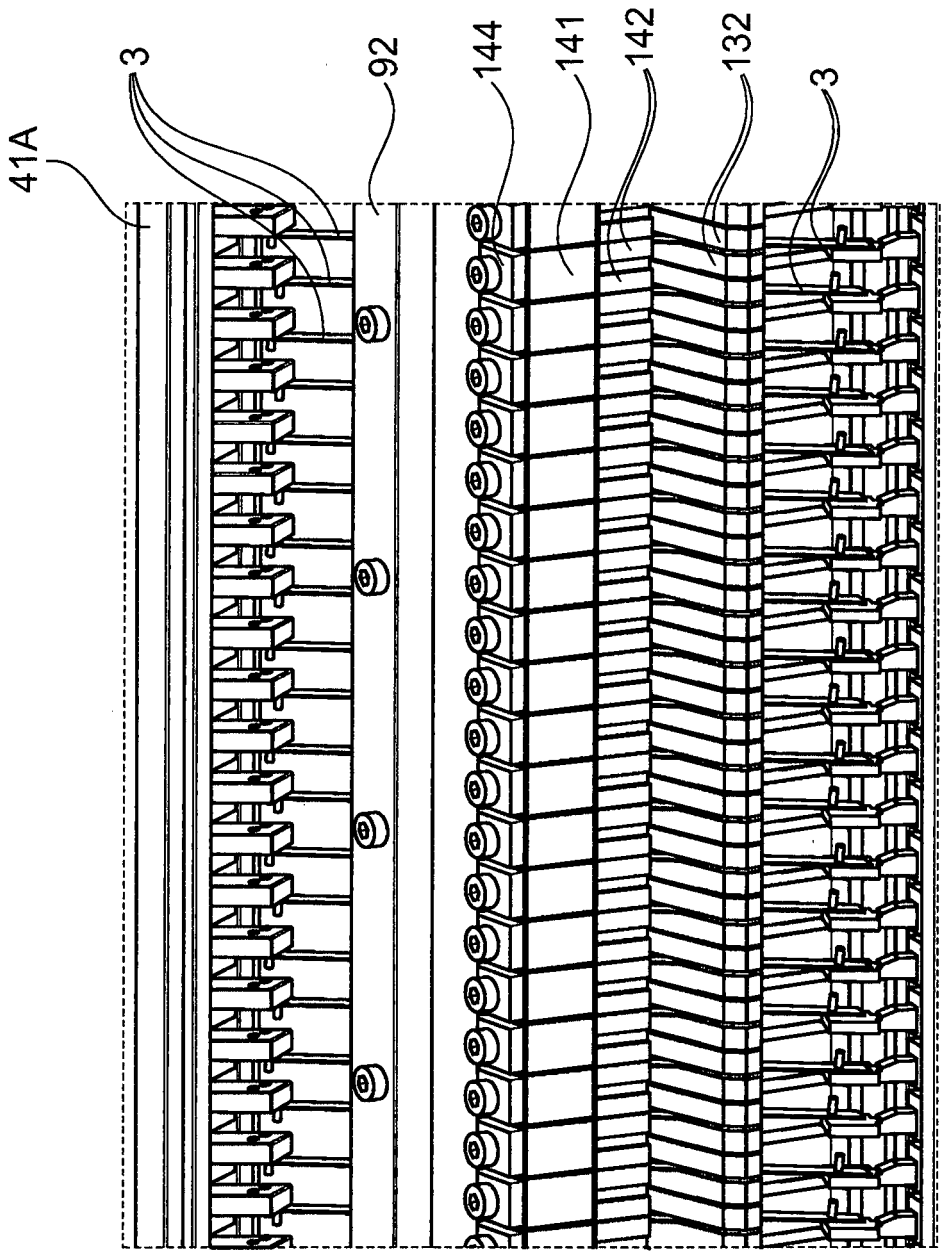

Fig. 7

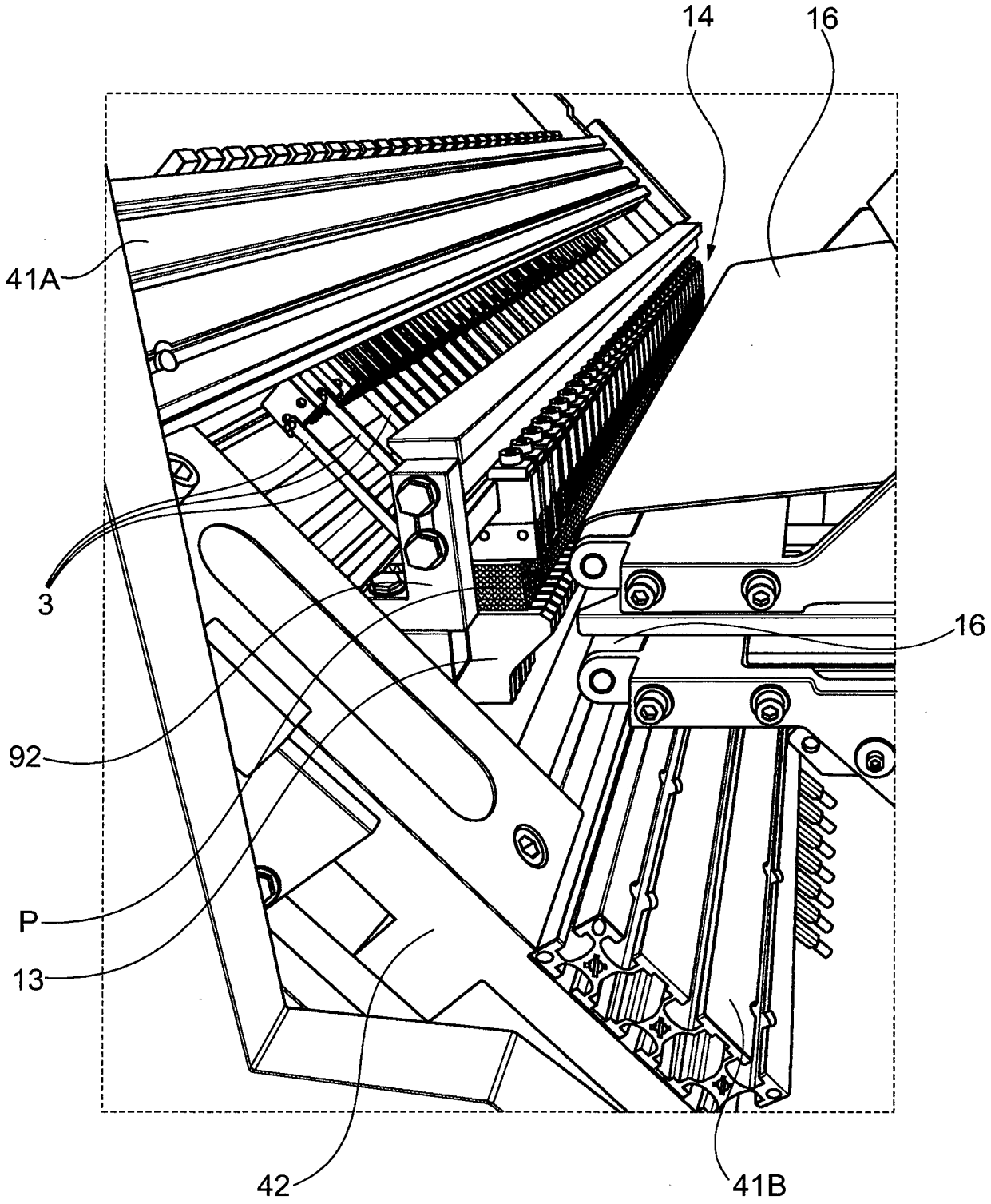

Fig. 8

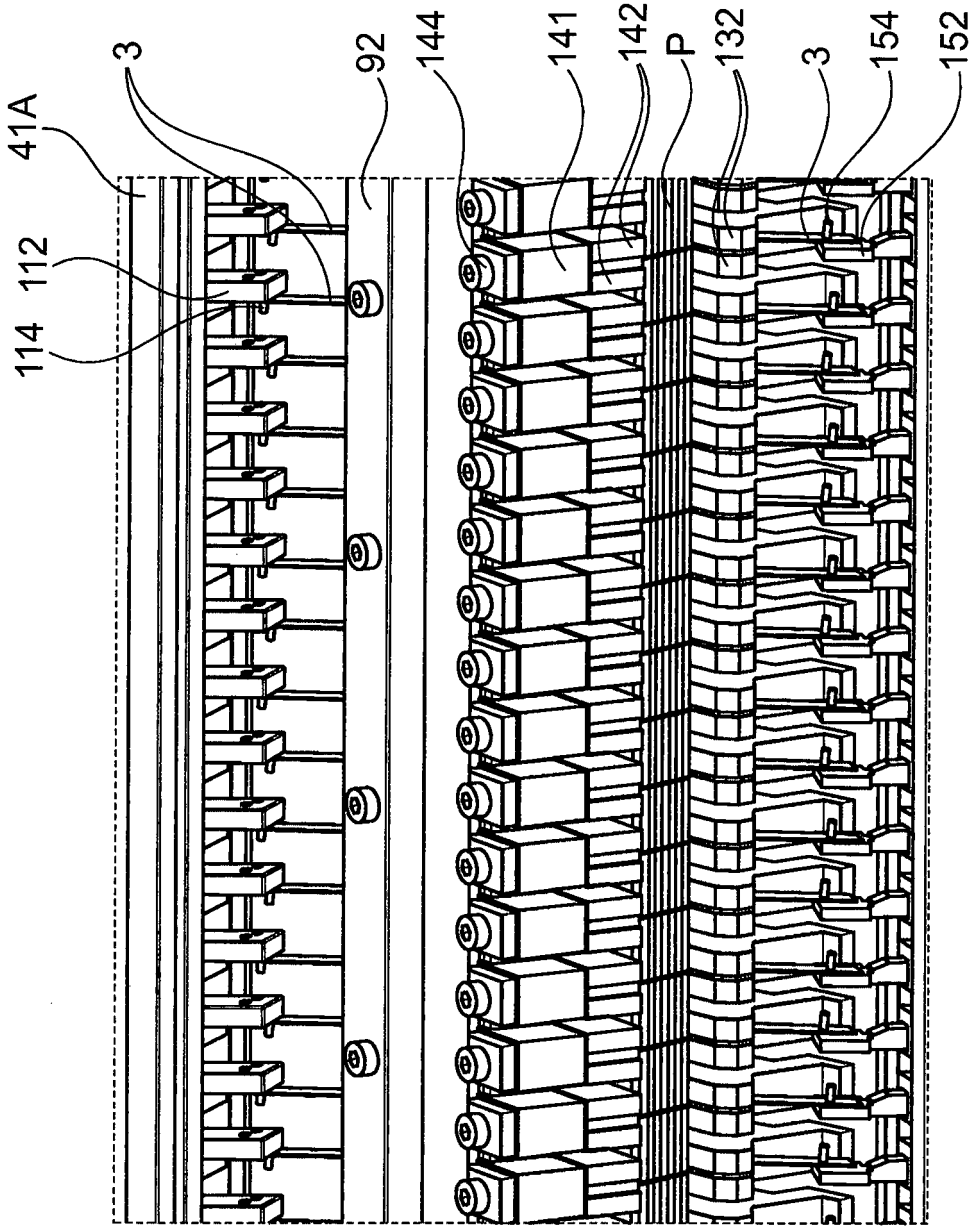

Fig. 9

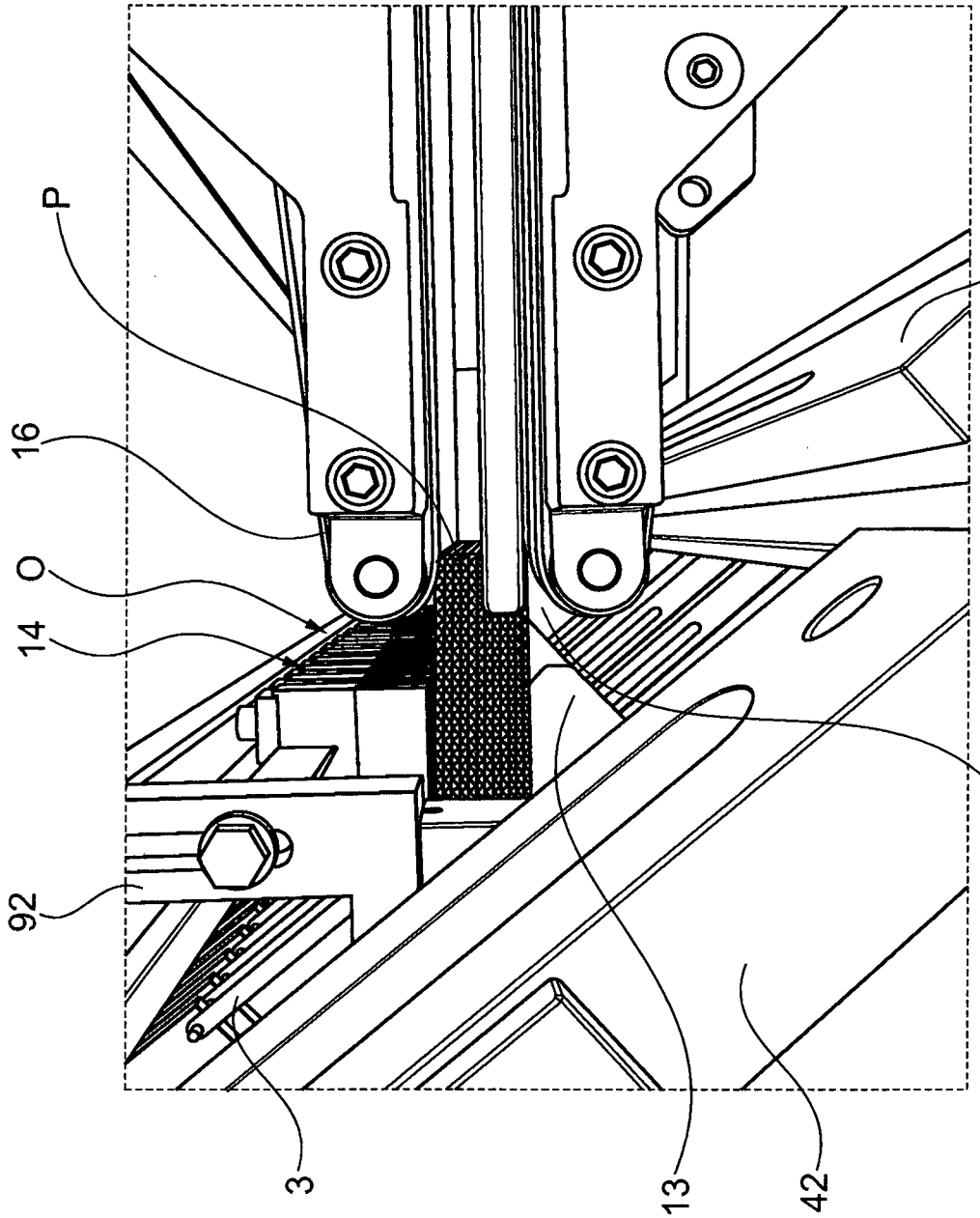

Fig. 10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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