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(54) Sawing machine and respective operating method

(57) The present invention concerns a sawing machine (1) for panels (P) comprising a table (2), on which said panels (P) are supplied, means for moving said panels (P) in said table (2), and a cutting section (3) of said panels (P), said machine (1) being characterized in that said cutting section (3) comprises at least one incision-cut unit (31) transversely movable according to two advancement-directions with respect to the direction of movement of said panels, which, in its turn, comprises: a first central circular blade (41), capable to assume a rest position and a cutting position, and to rotate in a first direction; a second circular blade (42), arranged in series to said first blade (41), having a thickness greater than that of said first blade (41), and rotating in a second direction, discordant with the one of said first blade (41), said second blade (42) being capable to assume a rest position, one or more incision positions and one or more cutting positions; and a third blade (43), arranged in series to said first blade (41), opposite with respect to said second blade (42), said third blade (43) having a thickness greater than that of said first (41) and second (42) blades, rotating according to said first direction, concordant with said first blade (41), and being capable to take a rest position and an incision position; said blades (41, 42, 43) being capable to cut or incise said panels (P) and being capable to be activated in such a way that, in each of said two advancement-directions, with respect to the movement direction of said panels, one of said blades (42, 43) is in incision position and one of said blades (41, 42) is in cutting position.

The present invention even concerns an operation method of a saw machine (1) for panels (P).

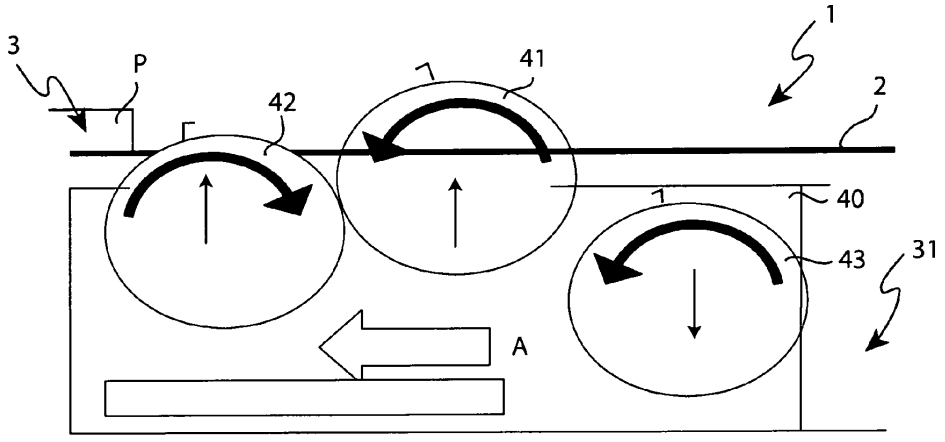

Fig.1

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Description

[0001] The present invention relates to a sawing machine and respective operating method.

[0002] More specifically, the invention concerns a machine suitable for cutting panels, in particular wooden panels, studied and realized to increase the production and machining efficiency.

[0003] In the following, the description will be directed to wooden panel cutting, but it is clear that the same should not be considered limited to this specific use.

[0004] As it is well known, at present in the field of woodworking, there are many machines to cut wooden panels.

[0005] In general, in the cutting of the panels, it can be distinguished: the X cut, which is a through cut, i.e. which passes from one side, to the opposite side of the panel, said cut being transverse to the entire width of the panel, Y cut, which is a through cut longitudinally along the entire length of the panel, the angular cut, which is a through angle cut from one side to the adjacent side of the panel (usually the panels are rectangular), and the Z cut, which is a longitudinal cut along a portion of the length of the panel. It can also distinguish the internal Z cut, when the cutting takes place in the interior of the panel, and lateral Z cut, when the cutting begins on one side of the panel. In the latter case, it is referred also with blind cut.

[0006] In general, in panels machining in cutting machines, optimizing the combination and the arrangement of the cuts is necessary, in order to make faster the obtaining of pieces needed and to reduce the waste of material. For this purpose, the Z cut, and in particular the blind cut, is very frequently applied.

[0007] A first example of a machine to cut wooden panels according to the prior art is described in patent application DE 10 2006 013 264 A1, which provides a support plan, in which the panels to be cut pass, a cutting unit, comprising a bridge on which a carriage is provided with. On said carriage blades for cutting of the panels are mounted.

[0008] Another example of a machine to cut wooden panels according to the prior art is also described in patent application EP 1321252A.

[0009] The aforementioned documents relate sawing plants that allow to carry out through cuts from one side of the panel, even arranging the panel in angular position. The systems described, although versatile, are not able to perform machining operations quickly.

[0010] Sawing machines, such as that described in patent application EP 2127829A1, are also known, which comprise an end mill to allow the Z cut, even internal. However, this type of machine is very slow in the machining.

[0011] Among other things, it must be considered that in the cutting units of the sawing machines, the cutting blade, which rotates, is generally preceded by a blade incision. This is due to the fact that if the cutting blade were applied directly on the panel to be cut, the teeth of said blade would enter on the surface of a face and come out on the surface of the opposite face, creating, especially on the surface of the face from which the teeth of the blade come out, splinters of the corners along the cutting line, which would create serious imperfections and difficulties in the following processing of the cut panel.

[0012] Instead, as it is well known in the field, to avoid this inconvenience, the cutting blade is preceded by an incision blade, as mentioned, rotating in the opposite rotation direction to the cutting one, having generally lower radius, but slightly greater thickness, typically only a few tenths of a millimeter, with respect to said cutting blade, and arranged in such a way to let enter the blade only on the surface of the face of the panel from which it is expected that the teeth of the cutting blade come out. In other words, the incision blade creates a sort of groove on the face of the panel from which it is expected that the teeth of the cutting blade that follows come out. In this way, the teeth of the incision blade enter the surface of the face of the panel from which the teeth of the cutting blade come out, so as not to create splinters protruding from said surface of said face, but creating a groove with a width slightly greater than the cutting blade, so that said cutting blade, when it comes out from the surface of the face on which it is placed the groove of said incision blade, having a thickness slightly smaller than said groove, does not create protruding splinters on said surface.

[0013] The necessity of providing the cutting unit equipped with an incision blade that precedes and has the appropriate arrangement and rotation with respect to said cutting blade, implies that to perform the blind cuts on opposite sides of a panel two separate cutting units are required, which implies a considerable increase of manufacture and realization costs of sawing machines.

[0014] Even for these manufacturing costs, generally there is a trend towards the equipment of the machines with end mills, which, although slow down considerably the production speed, allows realizing more economical machines.

[0015] In light of the above, it is, therefore, object of the present invention to propose a sawing machine capable to make lateral Z cuts or blind cuts, quickly and economically.

[0016] It is therefore a specific object of the present invention a sawing machine for panels comprising a table, on which said panels are supplied, means for moving said panels in said table, and a cutting section of said panels, said machine being **characterized in that** said cutting section comprises at least one incision-cut unit transversely movable according to two advancement-directions with respect to the direction of movement of said panels, which, in its turn, comprises: a first central circular blade, capable to assume a rest position and a cutting position, and to rotate in a first direction; a second circular blade, arranged in series to said first blade, having a thickness greater than that of said first blade, and rotating in a second direction, discordant with the one of said first

blade, said second blade being capable to assume a rest position, one or more incision positions and one or more cutting positions; and a third blade, arranged in series to said first blade, opposite with respect to said second blade, said third blade having a thickness greater than that of said first and second blades, rotating according to said first direction, concordant with said first blade, and being capable to take a rest position and an incision position; said blades being capable to cut or incise said panels and being capable to be activated in such a way that, in each of said two advancement-directions, with respect to the movement direction of said panels, one of said blades is in incision position and one of said blades is in cutting position.

[0017] Always according to the invention, said machine could comprise moving means to carry, by a command, each of said blades in one of said cutting, incision operative positions and rest position

[0018] Still according to the invention, said blades could comprise teeth oriented according to the rotation direction of the respective blade.

[0019] Further according to the invention, each of said blades cluld be provided with motorized rotation means.

[0020] Advantageously according to the invention, said incision-cut unit could comprise one or more carriages, on which said blades are mounted, said carriage being movable on a guide.

[0021] Always according to the invention, said third blade could have a smaller radius than that of said first and second blade.

[0022] Still according to the invention, said cutting section could comprise a plurality of incision-cut units.

[0023] It is further object of the present invention an operation method of a saw machine for panels, as defined above, comprising the following steps:

- when said incision-cut unit moves toward a first of said two advancement-directions, according to which said third blade is the blade that said panel to be cut meets first, then said third blade is in incision position, said second blade is in cutting position and said first blade is in rest position;
- when said incision-cut unit moves towards the second of said two advancement-directions, opposite to said first direction, according to which said second blade is the blade that said panel to be cut meets first, then said second blade is in incision position, said first blade is in cutting position and said third blade is in rest position.

[0024] The present invention will be now described, for illustrative but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figure 1 shows a portion of a sawing machine according to the present invention;
figure 2 shows a panel on which a blind cut on the right side has to be made;
figure 3 shows a panel on which on the left side a blind cut has to be made ;
figure 4 shows a portion of a sawing machine according to figure 1;
figures 5 and 6 show the portion of the sawing machine of figures 1 and 4, viewed from the opposite side with respect to the plane of the blades.

[0025] In the various figures, similar parts will be indicated by the same reference numbers.

[0026] Referring to figure 1, a portion of the sawing machine 1 according to the present invention can be observed.

[0027] The sawing machine 1 includes a table 2 on which the panels P to be cut are fed, means for moving said panels P (not shown in the figure) on said table 2 and a cutting section 3 of said panels P.

[0028] In the sawing machine 1 according to the present invention, said cutting section 3 comprises at least one incision-cut unit 31 movable from right to left and from left to right, transversely with respect to the feed direction of the panel P to be cut.

[0029] Said incision-cut unit 31 is arranged below said table 2 and comprises a carriage 40 movable along an appropriate guide (not shown in the figures). A first blade 41, provided with first motorized activation means (not shown in the figure), a second blade 42, provided with second motorized activation means (also not shown in the figure) and a third blade 43, provided with second motorized activation means (also not shown in the figure) are installed on said carriages 40. Said first blade 41 is arranged between said second 42 and said third blade 43.

[0030] It is considered that the motorized means can, possibly, be adapted to rotate said blades 41, 42 and 43 in both rotation directions.

[0031] Each of said three blades, moreover, is provided with moving means for moving vertically the respective blade, so that said first blade 41 can assume a rest position and a cutting operating position, said second blade 42 can assume a rest position, an incision operative position and a cutting operative position, and said third blade 43 can assume an incision operative position and a rest position.

[0032] Said blades 41, 42 and 43 have thicknesses different from each other. In particular, said second blade 42 has a thickness greater than said first blade 41 and said third blade 43 has a thickness greater than said second blade 42.

[0033] Furthermore, said blades 41, 42 and 43 have preset rotation direction. In particular, the first blade 41 has a first rotation_direction , which in this case is counterclockwise (see figure 1), while said second and said third blade, respectively 42 and 43, have a rotation direction clockwise and anticlockwise (again see figure 1).

[0034] The operation of the sawing machine 1 described above is as follows.

[0035] Figure 2 is considered, in which a panel P to which the blind cut has to be made on the right side, indicated with TC_d, is shown.

[0036] The incision-cut unit 31 moves from right to left, according to arrow A of figure 1.

[0037] By means of the respective movement means, the first and the second blades 41 and 42 are arranged respectively in cutting and incision operative position, while said third blade 43 is arranged in the rest position.

[0038] Said second blade 42 incises said panel P, while the first blade 41 cuts it, thus fulfilling the requirement that the thickness of said second blade 42, which incises, is slightly greater than the thickness of said first blade 41 which cuts. Moreover, the second blade 42 "enters" the surface of the table from which the first blade 41 "comes out", which here, as mentioned, has the function of cutting.

[0039] Referring now to figure 3, a panel P, to which the blind cut has be made on the left side, indicated with TC_s, is shown.

[0040] In this case, the same incision cut unit 31, moves from left to right, according to the arrow B of figure 4.

[0041] Moreover, always by means of the respective movement means, the second and the third blades 42 and 43 are arranged respectively in the cutting and incision operation position, while said first blade 41 is arranged in rest position.

[0042] Said third blade 43 incises said panel P, while said second blade 42 cuts it. Even in this case, the requirement according to which the thickness of said third blade 43, which incises, is slightly greater than the thickness of said second blade 42, which cuts, is fulfilled. Moreover, said third blade 43 "enters" the surface of the table from which "comes out" the second blade 42, which, as mentioned, has the function of cutting.

[0043] As it can be seen, said first 41 and second 42 blades at least once perform the function of cutting the panel P, while third blade 43 performs only the incision function, therefore, it can have a smaller radius than the other two.

[0044] Of course, said cutting unit 31 also carries out Y cuts, but it is able to do so in both movement directions, i.e. moving both in the movement direction A, and in the movement direction B.

[0045] Figures 5 and 6 show the incision-cut unit 31 from the opposite side with respect to the plane of the blades, in which the first blade 41, in this case, is seen rotating in the opposite way to that described in figures 1 and 4, i.e. clockwise instead of counterclockwise. Even in this case, the second blade 42 has a thickness greater than said first blade 41 and said third blade 43 has a thickness greater than said second blade 42, although, with respect to figures 1 and 4, said third blade 43 and said second blade 42 are exchanged in position, with respect to said first blade 41.

[0046] In this view, in order to make a blind cut on the left side indicated with TC_s, as shown in figure 5, said incision-cut unit 31 moves according to the arrow B, the first and the second blades 41 and 42 are arranged respectively in cutting and incision operative position, while said third blade 43 is arranged in rest position. Said second blade 42 incises said panel P, while the first blade 41 cuts it.

[0047] Instead, to make a blind cut on the right side indicated with TC_d, as shown in figure 6, said incision-cut unit 31 moves according to the arrow A, the second 42 and the third 43 blades are arranged respectively in cutting and incision operative position, while said first blade 41 is arranged in rest position. Said third blade 43 incises said panel P, while said first blade 41 cuts it.

[0048] The third blade 43, the largest of the three, as it can not ever have a blade that cuts, i.e. provided with a greater thickness, carries out only the incision function, can have a radius smaller than that of the other two blades.

[0049] It is considered that the cutting section 3 of said sawing machine 1 according to the present invention may comprise a plurality of cutting units 31, so as to make a plurality of blind cuts or TY cuts at the same time.

[0050] The present invention has been described for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that modifications and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

Claims

1. Sawing machine (1) for panels (P) comprising a table (2), on which said panels (P) are supplied,
means for moving said panels (P) in said table (2), and
a cutting section (3) of said panels (P),
said machine (1) being **characterized in that** said cutting section (3) comprises at least one incision-cut unit (31) transversely movable according to two advancement-directions with respect to the direction of movement of said panels, which, in its turn, comprises:

- a first central circular blade (41), capable to assume a rest position and a cutting position, and to rotate in a first direction;
- a second circular blade (42), arranged in series to said first blade (41), having a thickness greater than that of said first blade (41), and rotating in a second direction, discordant with the one of said first blade (41), said second blade (42) being capable to assume a rest position, one or more incision positions and one or more cutting positions; and
- a third blade (43), arranged in series to said first blade (41), opposite with respect to said second blade (42), said third blade (43) having a thick-

ness greater than that of said first (41) and second (42) blades, rotating according to said first direction, concordant with said first blade (41), and being capable to take a rest position and an incision position;
said blades (41, 42, 43) being capable to cut or incise said panels (P) and being capable to be activated in such a way that, in each of said two advancement-directions, with respect to the movement direction of said panels, one of said blades (42, 43) is in incision position and one of said blades (41, 42) is in cutting position.

2. Machine (1) according to claim 1, **characterized in that** it comprises moving means to carry, by a command, each of said blades (41, 42, 43) in one of said cutting, incision operative positions and rest position.

3. Machine (1) according to anyone of the preceding claims, **characterized in that** said blades (41, 42, 43) comprise teeth oriented according to the rotation direction of the respective blade (41, 42, 43).

4. Machine (1) according to anyone of the preceding claims, **characterized in that** each of said blades (41, 42, 43) is provided with motorized rotation means.

5. Machine (1) according to anyone of the preceding claims, **characterized in that** said incision-cut unit (31) comprises one or more carriages (40), on which said blades (41, 42 and 43) are mounted, said carriage (40) being movable on a guide.

6. Machine (1) according to anyone of the preceding claims, **characterized in that** said third blade (43) has a smaller radius than that of said first (41) and second (42) blade.

7. Machine (1) according to anyone of the preceding claims, **characterized in that** said cutting section (3) comprises a plurality of incision-cut units (31).

8. Operation method of a saw machine (1) for panels (P), as defined in claims 1-7, comprising the following steps:

- when said incision-cut unit (31) moves toward a first of said two advancement-directions, according to which said third blade (43) is the blade that said panel (P) to be cut meets first, then said third blade (43) is in incision position, said second blade (42) is in cutting position and said first blade (41) is in rest position;
- when said incision-cut unit (31) moves towards the second of said two advancement-directions, opposite to said first direction, according to which said second blade (42) is the blade that said panel (P) to be cut meets first, then said second blade (42) is in incision position, said first blade (41) is in cutting position and said third blade (43) is in rest position.

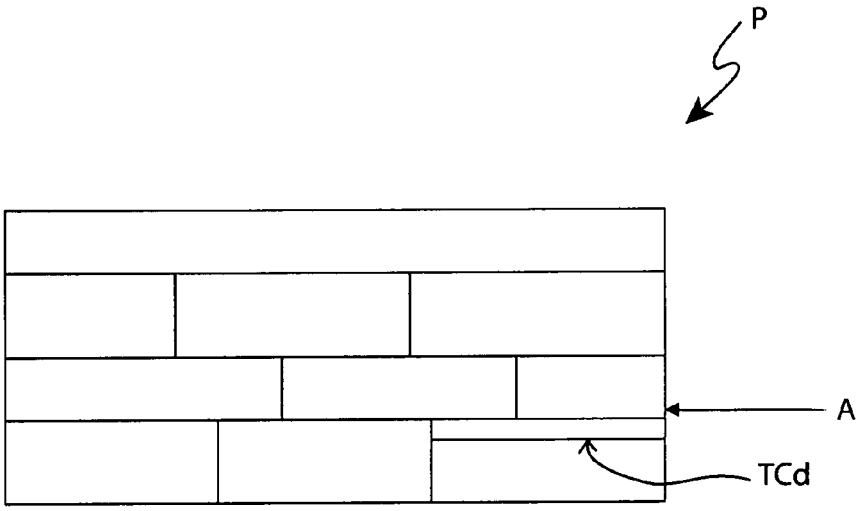

Fig.2

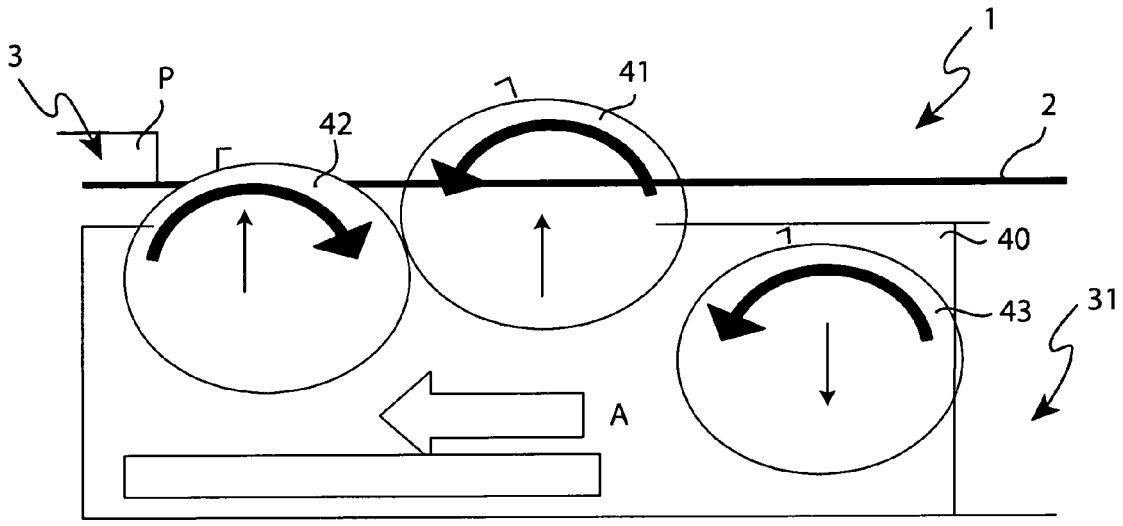

Fig.1

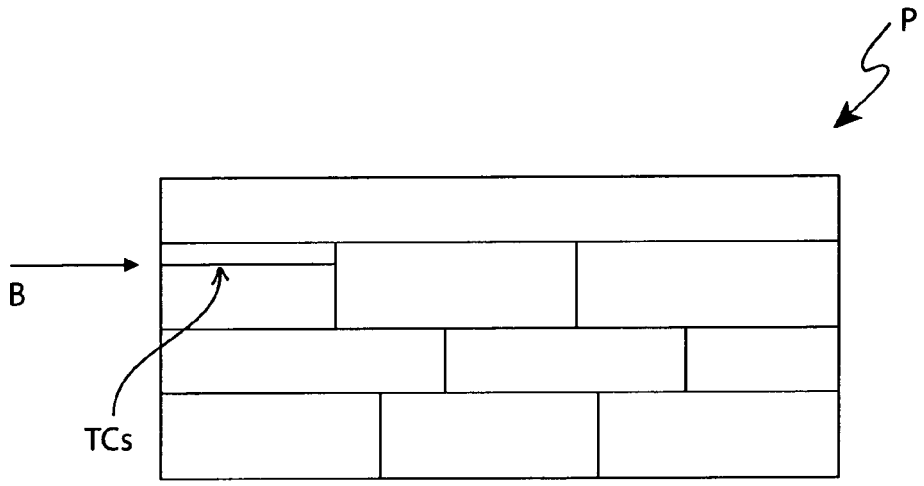

Fig.3

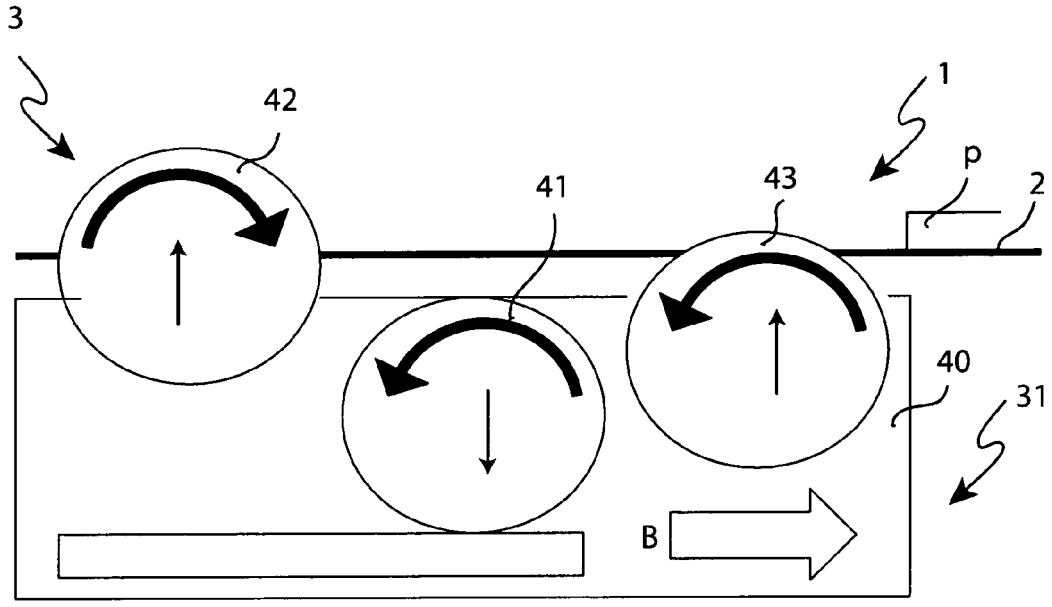

Fig.4

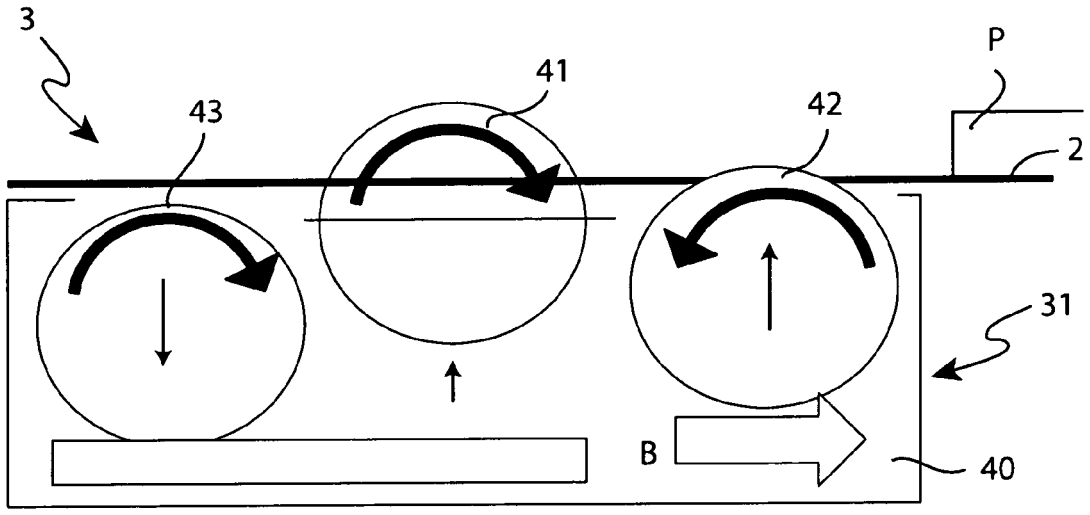

Fig.5

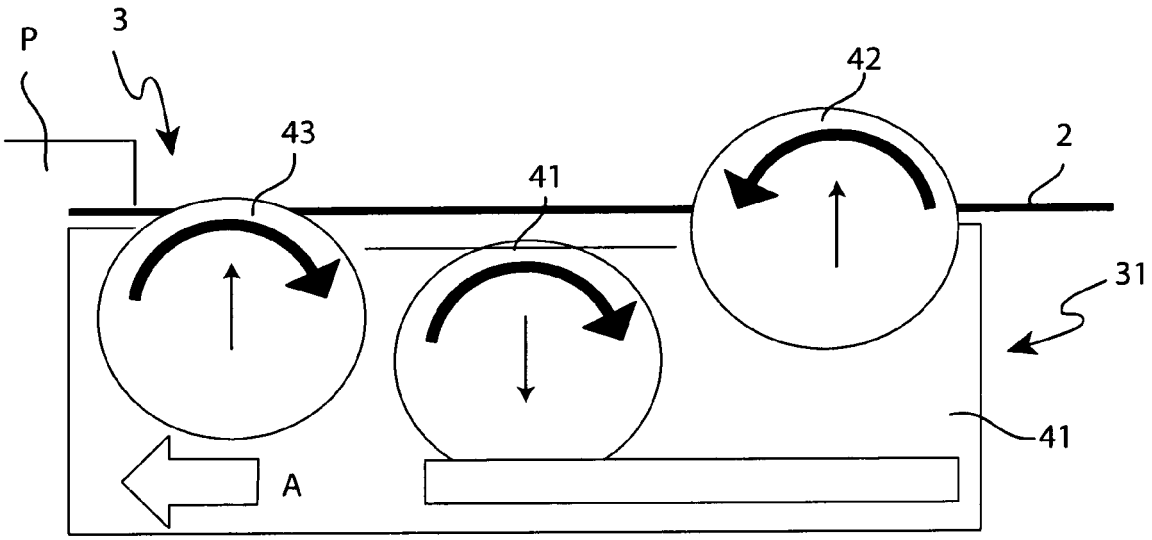

Fig.6

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EUROPEAN SEARCH REPORT

Application Number
EP 12 42 5147

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 198 59 792 A1 (HOLZMA MASCHINENBAU GMBH [DE]) 29 June 2000 (2000-06-29) * the whole document * -----	1-8	INV. B27G19/10 B27B5/075

TECHNICAL FIELDS SEARCHED (IPC)

B27G
B27B
B23D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 October 2012	Rijks, Mark

CATEGORY OF CITED DOCUMENTS

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30-10-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19859792 A1	29-06-2000	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- EP 1321252 A **[0008]**
- EP 2127829 A1 **[0010]**