



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 1 034 882 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**13.09.2000 Bulletin 2000/37**

(51) Int. Cl.<sup>7</sup>: **B24B 9/02**

(21) Application number: **00104873.5**

(22) Date of filing: **07.03.2000**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(30) Priority: **11.03.1999 DK 34899**

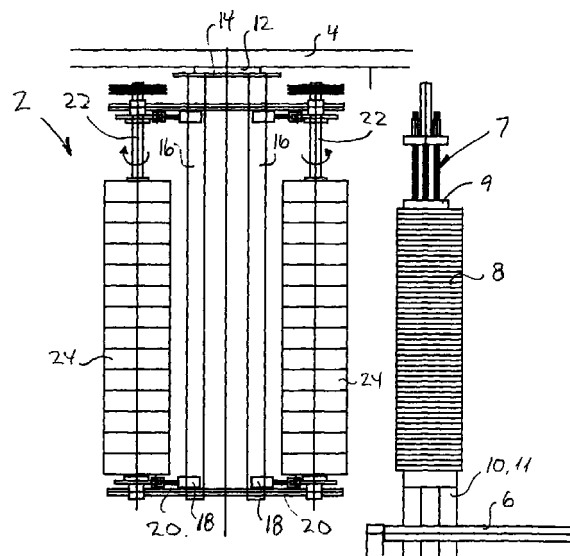
(71) Applicant: **Kristiansen, Karsten  
8870 Langa (DK)**

(72) Inventor: **Kristiansen, Karsten  
8870 Langa (DK)**

(74) Representative:  
**Gregersen, Niels Henrik et al  
Patrade A/S  
Aaboulevarden 21  
8000 Aarhus C (DK)**

(54) **An apparatus for edge grinding plate-like articles in a vertical stack, e.g. laminboards**

(57) There is described an apparatus (2) for edge grinding of plate-like items, e.g. laminboards, e.g. laminboards, comprising a carrying transom (4) displaceable in the longitudinal direction, a trolley (12) with a turning ring (14) which is displaceable transversely thereto, a roller conveyor (6) for stacks (8) of plate-like items, a fixing device along the roller conveyor (6) for the said item stacks (8), and a programmable, preferably combined electronic and pneumatic, control system, which apparatus comprises a number of vertical carrying beams (16) suspended by the turning ring (14), and which are mutually connected by means of a number of horizontal bushing pipes (18) in which there are mounted sliding rod guides (20) for two vertical shafts (22) on which there is mounted large number of grinding means rollers forming vertical grinding cylinders (24) that preferably have greater length than height in comparison with the said item stacks (8), and which are connected with each their driving motor, e.g. via driving belt wheels and driving belts, so that said grinding cylinders (24) may rotate with each their direction of rotation. In a simple way it hereby becomes possible to mechanize the very heavy and work environment detrimental work connected with edge grinding of plate-like items, e.g. stacked laminboards, which apparatus in addition makes possible to optimise the grinding work itself.



**Fig. 1**

**EP 1 034 882 A2**

## Description

**[0001]** The present invention concerns an apparatus for edge grinding of plate-like items in a vertical stack, e.g. laminboards, and of the kind indicated in the preamble of claim 1.

**[0002]** When producing furniture, e.g. bookcases, there is used a very large number of laminboards that are given a final varnishing, though an intermediate grinding has to be performed beforehand because the surface of the laminboards may "rise" by the first varnishing. Usually the laminboards are placed in stacks which are advanced on roller conveyors between the respective varnishing and grinding stations where varnishing and edge grinding are performed manually. Even though protective equipment is used to some extent in connection with the manual varnishing work, e.g. face mask with breathing protection, we are talking about work which is very detrimental to the work environment.

**[0003]** Even the edge grinding which until now also has been performed by means of manual grinding equipment, also imply a serious work environmental load as the grinding equipment - even though it is suspended in a flexible carrying strap system and connected with a suction hose - is relatively heavy to operate because both pressing against and the lateral movement of the grinding equipment (grinding rollers of grinding strips and intermediate support brushes) along the plate stack occurs manually.

**[0004]** The fact that the grinding work takes places manually furthermore has an adverse influence on the quality of the grinding work which requires very precisely controlled grinding movements in order to achieve a reasonable uniform quality together with a certain direction of rotation has to be used, namely so that the concurrently rotating grinding roller (same direction of rotation and displacement) from insertion against the edges of the stack is moved horizontally outward past the end edges of the plate items.

**[0005]** On this background, the invention has the object of indicating a new and improved apparatus of the kind mentioned in the introduction, which apparatus in a simple way makes possible to mechanize the very heavy and work environmentally detrimental work connected with edge grinding of plate-like items, e.g. stacked laminboards, which apparatus in addition simultaneously makes possible to optimise the grinding work itself.

**[0006]** The apparatus according to the invention is characterised in that it comprises a number of vertical carrying beams suspended by the turning ring, and which are mutually connected by means of a number of horizontal bushing pipes in which there are mounted sliding rod guides for two vertical shafts on which there is mounted large number of grinding means rollers forming vertical grinding cylinders that preferably have greater length than height of the said item stack, and

which are connected with each their driving motor, e.g. via driving belt wheels and driving belts, so that said grinding cylinders may rotate with opposite direction of rotation. In a simple way it hereby becomes possible to mechanize the very heavy and work environment detrimental work connected with edge grinding of plate-like items, e.g. stacked laminboards, which apparatus in addition makes possible to optimise the grinding work itself.

**[0007]** For pre-programmed intermediate grinding of item stacks of varying heights it may be advantageous that the grinding apparatus according to the invention is thus designed so that the grinding cylinders have lesser height than the stack of items, and that the grinding cylinders furthermore are arranged to be displaced vertically, i.e. the grinding cylinders, for example by grinding a stack of table tops, advantageously be moved across all the edges of the items from both sides and with concurrently rotating grinding cylinders.

**[0008]** Suitably, the grinding apparatus according to the invention is thus designed so that said fixing device for the item stacks is constituted by fixed supports in interspaces between the rollers of the roller conveyor, on which supports the item stacks may be supported when the roller conveyor is lowered, and by upper clamping plates arranged to be pressed onto the upper side of the item stacks.

**[0009]** Alternatively, the grinding apparatus according to the invention may thus be designed so that said fixing device of the item stacks is constituted by vertically adjustable supports in interspaces between the rollers of the roller conveyor, which supports are arranged to lift the item stacks off the said roller conveyor, and by upper clamping plates against which the upper side of the item stacks are pressed when said supports are displaced upward.

**[0010]** With the purpose of correcting possible maladjustments of the item stacks, the grinding apparatus according to the invention may be designed in such a way that said sliding rod guides at respective ends of the vertical grinding cylinders comprise pneumatic spring cylinders or compression springs that, for example, are controlled by so-called reed relays, and which are arranged to regulate the pressure from the vertical grinding cylinders against the item stacks.

**[0011]** The grinding apparatus according to the invention is preferably built into a dust-proof cabin which is supplied with air at the top and wherefrom air and grinding dust is sucked out along the floor, preferably at opposite, long sides of the cabin.

**[0012]** The invention is explained in the following in connection with the drawing, on which:

Fig. 1 shows a plane view of an embodiment of a grinding apparatus according to the invention,

Fig. 2 shows an example of a complex shape of a plate item that may be edge ground by

- means of the apparatus according to the invention,
- Fig. 3 shows another example of a more simple shape of plate item that may be edge ground by means of the apparatus according to the invention,
- Fig. 4 show a further example of an even more simple shape of a plate item that may be edge ground by means of the apparatus according to the invention, and
- Fig. 5 shows a photograph of an apparatus according to the invention, which apparatus is built into a mainly dust-proof cabin to which air is supplied at the top and wherefrom air and grinding dust is sucked out along the floor at opposite, long sides of the cabin.

[0013] The grinding apparatus 2 shown in Fig. 1 comprises a carrying transom 4 which in a way not shown is displaceably suspended at opposite walls of a cabin (Fig. 5), and which may be displaced along a roller conveyor 6 on which item stacks 8 may be advanced to the grinding apparatus 2. The item stack 8 shown in Fig. 1 is supported by supports 10 that are either stationary, as the roller conveyor 6 in that case is arranged to be lowered for setting down the item stack 8, or is vertically adjustable, in which case the roller conveyor 6 is stationary. It is to be mentioned that the item stacks possibly are placed on special mounting plates or trestles on the roller conveyor, and that the item stacks before the grinding are also lifted free of the mounting plates or trestles.

[0014] On the carrying transom 4 there is arranged in a not shown way a displaceable trolley 12 on which is mounted a turning ring 14. On this is fastened two pairs of vertical carrying beams 16 through which horizontal bushing pipes 18 for slide rod guides 20 extend at opposite ends of the carrying beams 16. The sliding rod guides 20 carry two throughgoing, vertical shafts 22 on which a large number of grinding means rollers are fastened, the rollers forming vertical grinding cylinders 24 having greater length than height of the said item stacks 8, and which e.g. via driving belt wheels 26 are connected with each their driving motor so that the grinding cylinders may be rotated in each their direction of rotation.

[0015] In other words, the carrying transom 4, the trolley 12, the turning ring 14 thus makes possible that each of the oppositely rotating grinding cylinders 24 may be moved in against and moved along the side of the side of the item stack 8 in a pre-programmable way and in turn, for example for intermediate grinding of the item edges between two varnishings.

[0016] Fig. 2 shows an embodiment of a plate item 28 with relatively complex edge shape which without any problems may be edge ground by means of the apparatus according to the invention, as the grinding

cylinders 24, as indicated to the left in Fig. 2, with concurrent direction of rotation may be moved out beyond the edge of the item 28 without the risk of ripping up the veneer covering at the sharp corner of the item.

[0017] Likewise, it is, as indicated to the right in Fig. 2, how a concurrently rotating grinding cylinder 24 may be moved along the round edge shape and further out to the rear edge of the item 28.

[0018] Fig. 3 shows a second embodiment of a plate item 30, for example consisting of solid wooden slats and having rounded corners at the transition between front edges and side edges. The grinding cylinders 24 may here without any problems, as indicated, with concurrent direction of rotation (i.e. collective superior movement) may be moved around the rounded corners without implying risk of edge damages. By this type of solid plate items it will also be an advantage that also the rear side edge is automatically intermediately ground by passage of the grinding cylinders in both directions and with concurrent direction of rotation.

[0019] Fig. 4 shows an embodiment for a very simple plate item 32 having three side edges, i.e. the front long side edge and both short side edges are provided with veneer covering of wood, which in particular makes the corner areas very sensitive to grinding damages. In other words, here it is important that the grinding cylinders 24 in turn with concurrent direction of rotation is moved out beyond the corners, which naturally is the case by grinding all three veneer covered edges.

[0020] As shown in Fig. 5, the apparatus according to the invention is preferably built into a cabin 34 which at the top is supplied with fresh air and which at the bottom, along opposite long sides, is provided with suction nozzles so that grinding dust may be sucked out of the cabin 34. The apparatus comprises a combined electronic and pneumatic control system that makes possible to pre-program and automate the whole grinding process so that no persons have to stay in the cabin 34.

## Claims

1. An apparatus (2) for edge grinding of plate-like items in a vertical stack, e.g. laminboards, comprising a carrying transom (4) displaceable in the longitudinal direction of the stack, a trolley (12) with a turning ring (14) which is displaceable transversely thereto, a roller conveyor (6) for stacks (8) of plate-like items, a fixing device (7) arranged over and under, respectively, the roller conveyor (6) for the said item stacks (8), and a programmable, preferably combined electronic and pneumatic, control system, **characterised** in that it comprises a number of vertical carrying beams (16) suspended by the turning ring (14), and which are mutually connected by means of a number of horizontal bushing pipes (18) in which there are mounted sliding rod guides (20) for two vertical shafts (24) on which there is mounted large number of grinding

means rollers forming vertical grinding cylinders (24) that preferably have greater length than height of the said item stack (8), and which are connected with each their driving motor, e.g. via driving belt wheels and driving belts, so that said grinding cylinders (24) may rotate with opposite direction of rotation.

2. A grinding apparatus according to claim 1, **characterised** in that the grinding cylinder has lesser height than the stack of items (8), and that the grinding cylinders furthermore are arranged to be displaced vertically.
3. A grinding apparatus according to claim 1, **characterised** in that said fixing device (7) of the item stacks is constituted by fixed supports (10) in interspaces between the rollers of the roller conveyor, on which supports (10) the item stacks (8) may be supported when the roller conveyor (6) is lowered, and by upper clamping plates (9) arranged to be pressed onto the upper side of the item stacks (8).
4. A grinding apparatus according to claim 1, **characterised** in that the said fixing device (7) for the item stacks (8) is constituted by vertically adjustable supports (11) in interspaces between the rollers of the roller conveyor, which supports (11) are arranged to lift the item stacks (8) off the said roller conveyor (6), and by upper clamping plates (9) against which the upper side of the item stacks (8) are pressed when said supports (11) are displaced upward.
5. A grinding apparatus according to claim 1, **characterised** in that said sliding rod guides (20) at respective ends of the vertical grinding cylinders (24) comprise pneumatic spring cylinders or compression springs that, for example, are controlled by so-called reed relays, and which are arranged to regulate the pressure from the vertical grinding cylinders (24) against the item stacks (8), i.e. correct possible maladjustment in the item stacks (8).
6. A grinding apparatus according to claim 1, **characterised** in that it is built into a cabin (34) which is supplied with air at the top and wherefrom air and grinding dust is sucked out along the floor at opposite, long sides of the cabin.

50

55

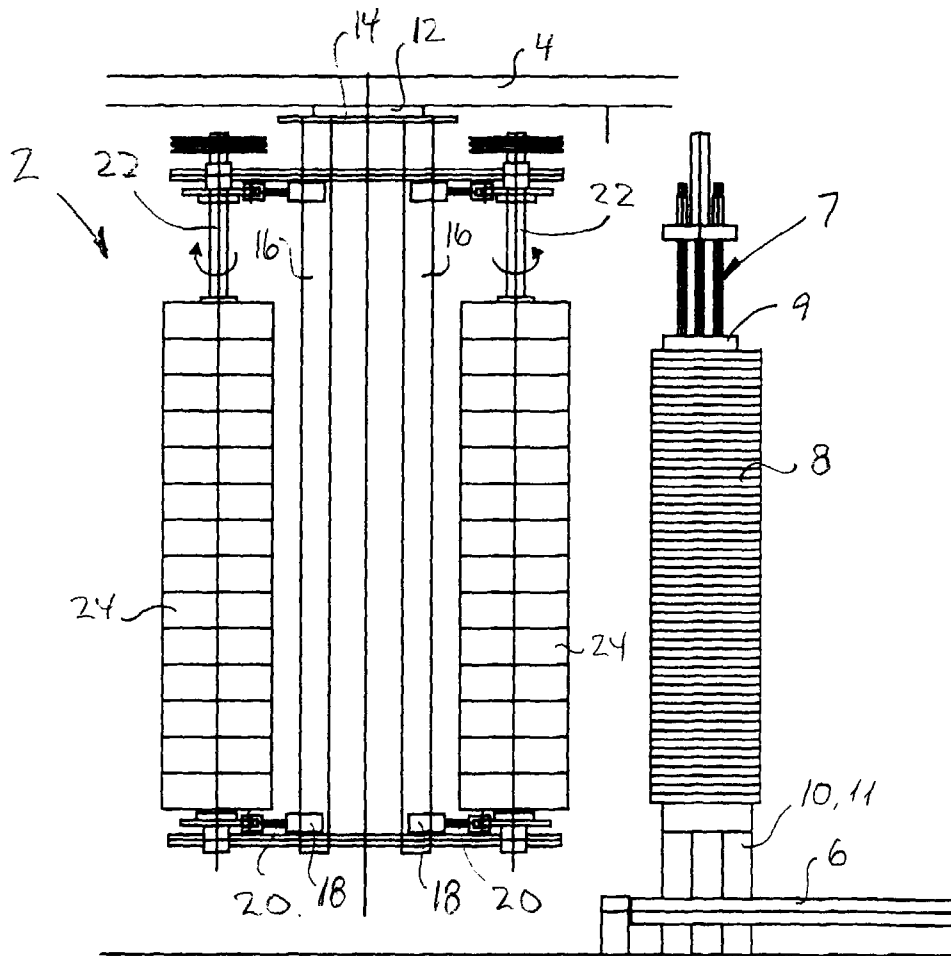


Fig. 1

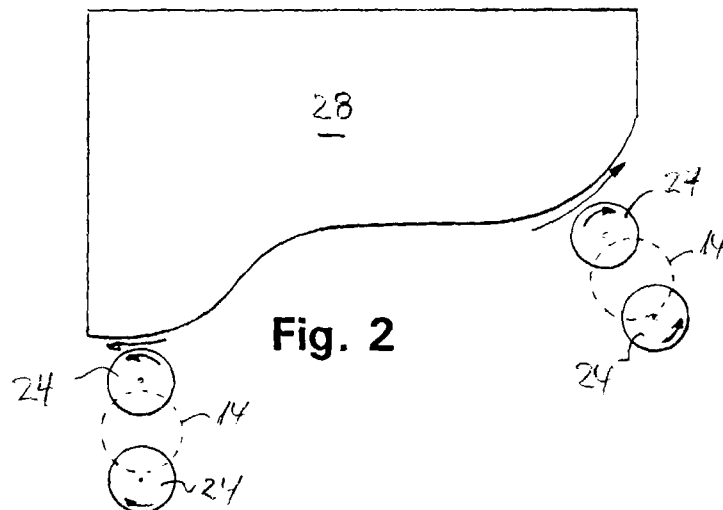


Fig. 2

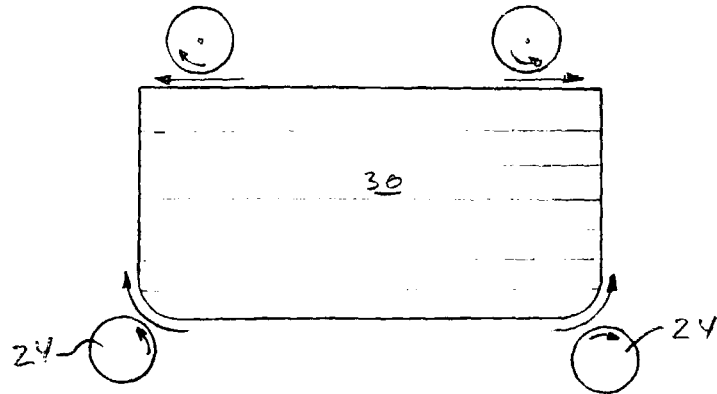


Fig. 3

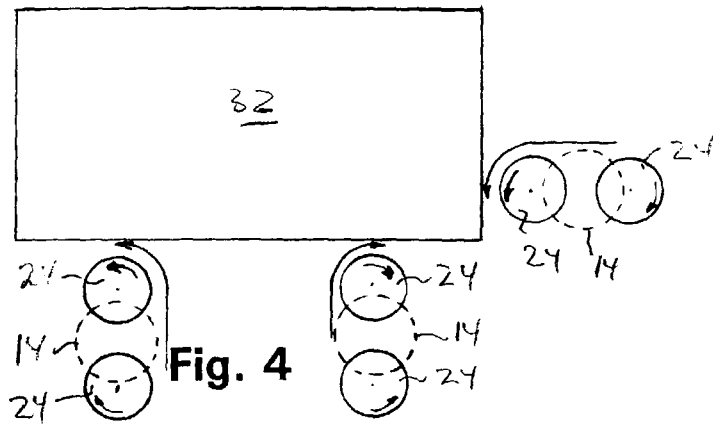


Fig. 4



Fig. 5