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(71) Applicant: **Volpato SRL**
35011 Campodarsego (PD) (IT)

(72) Inventor: **Volpato SRL**
35011 Campodarsego (PD) (IT)

(54) **TRIANGULAR-SYSTEM BELT SANDER WITH BRUSH AND ANGLE GEAR**

(57) The invented machinery is composed by the three components: belt unit, brush unit and table unit. It is the only one on the market that combines the single manual machine process with the abrasive belt and the automatic motion of the tangential brush. Through the insertion of an angle gearbox there is the possibility to perform even the head work.

This machinery allows to carry out the main finishing processes on wood panels or other materials and to perform the main steps typical of the High Gloss Finish treatment: levelling and sanding with cross-belt, smoothing and polishing. Such a machinery allows to obtain a final result characterised by higher quality than the result obtained by traditional existing methods. Thus the invention permits the small and medium-size companies (the main niche market involved in the machinery purchasing) to impose itself on the market without having to turn to a large company in order to make the High Gloss Finish treatment or alternatively to make it independently with portable equipment.

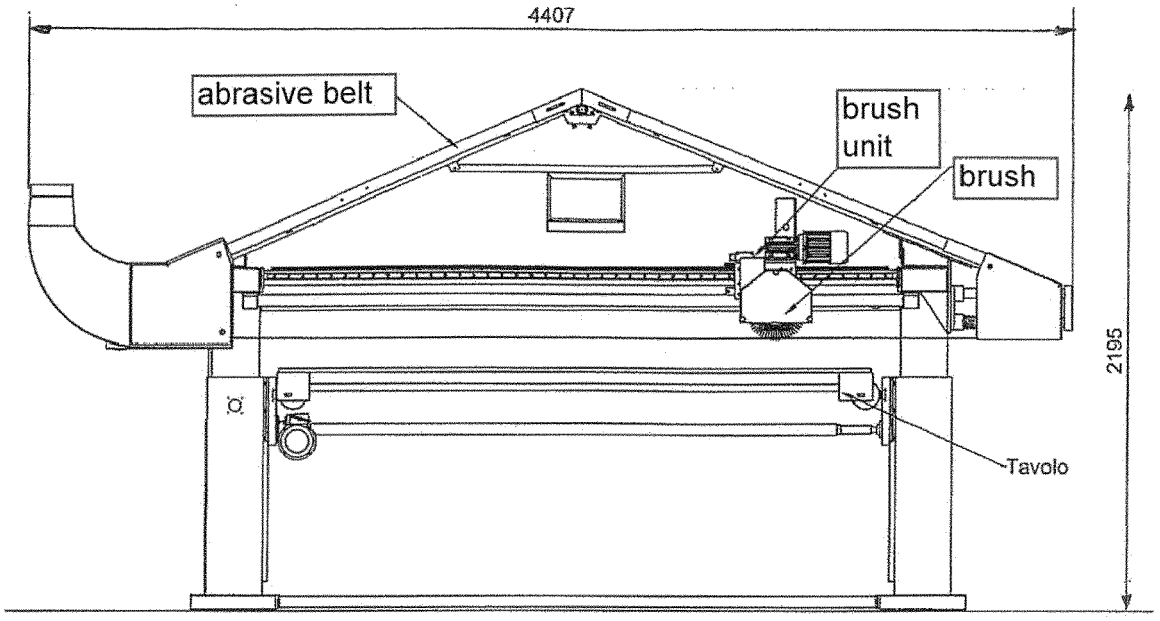

Fig. 1

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Description

R. 42 (1) (a)

Technical field to which invention relates

[0001] The invention is a semiautomatic machinery with options for total automation which can be used to refine flat surfaces of wood panels or other materials (e.g. metal, glass, fibreglass, plastic). The machine fits the market of finishing panel machines for small and medium-size companies.

R. 42 (1) (b)

Indication of the background art

[0002] According to the current state of the art, the finishing work such as calibration, spray painting, smoothing, polishing, rustication, sanding, etc., done by artisans who treat small/medium volume of material, is handmade. Alternatively it is done by using specific portable equipment for each type of treatment.
This approach limits the manufacturing and the product quality, since in order to obtain a good result a continuous and homogeneous movement is needed. Therefore such a manual process cannot guarantee high quality products.
Actually finishing process, especially High Gloss finishing, are carried out as described below.
After the first painting stage (priming), the sanding of the treated surface is completed, followed by the second (or third) painting stage. In order to obtain this type of finishing a three-step process is needed:

A - Levelling the painted panel with a P 1000 or P 1200 abrasive belt according to the hardness of the paintwork in order to achieve flatness and uniformity of the panel;

B - Smoothing by using cotton rollers with abrasive paste, moved in cross direction with respect to the belt direction used in the previous step;

C - Polishing with foam brushes and Polish paste which are working at the head side eliminating all the marks made in previous treatments.

[0003] In big companies, this three-step manufacturing process is normally performed by using in line machines, at least one machine for each single step. So the daily production reaches a large number of processed panels in terms of square meters.
[0004] Taking into account the investment cost and the large quantities produced, this type of machinery is not convenient for artisans who treat small/medium volume of material.
The small and medium-sized company then asks to the big company for this kind of work or alternatively it decides to make a High Gloss Finish with portable equipment. In this case, however, high quality result cannot be achieved because the handmade work of the operator is not so uniform as the finishing treatment would require. Moreover the work is very demanding so the operator produce small quantities of processed panel.

R. 42 (1) (c)

Technical problem to be solved

[0005] The technical problem solved by the new machinery (industrial invention) is to perform automatically or almost automatically the sequence of stages described above. In this way time is saved and the finishing quality of the product is improved, increasing the value for money.
Therefore the new equipment and the related investment, suitable for small and medium-size companies, guarantees them to make an high quality finishing work. At present such a process is manually done by artisans with poor quality results. Alternatively the small artisans turn to the big company in order to get high quality finishing work.

R. 42 (1) (c)

Disclosure of invention

[0006] The machinery, object of industrial invention, is the only one in the market that combines the manual work of the abrasive belt with the automatic movement of the tangential brush. Moreover it is possible to insert an angle gearbox on the tangential brush to allow even the head work.
Nowadays this machinery (Figure 1) is the only one in the market that can realize the High Gloss Finish (super deep gloss) and many other processes suitable not only for wood but also for steel and other materials. At present the small and medium-size companies make that kind of finishing work with portable equipments, operating a series of subsequent steps.
The machinery is made up of three basic parts.

- Belt unit: (Figure 2; detail n.02 in Figure 5). The belt is rotated through the driving pulley by an engine with a power of 3 kW and speed adjusted through inverter (0 to 1400 rpm); speed regulation is carried out by the operator using a potentiometer placed on the control panel in the centre of the machine.
  The possibility to change the speed of the abrasive belt allows to handle different materials, according to the type of abrasive belt used. The operator, by pressing a lever placed on the metal pad, applies the right pressure to allow the workpiece to come into contact with the abrasive belt.
- Brush unit: (Figure 3; detail n.02 in Figure 5; detail

n.04 in Figure 6).

The brush unit engine has a power of 3 kW and is powered by inverter. The rpm speed (0-1400 rpm) can be changed by the operator using the potentiometer located on the control panel in the centre of the equipment.
The engine has a case made of extruded aluminium and a shaft 215 mm long, measuring 30 mm in diameter, with threaded end. This feature allows to place any type of brush for tangential work on the workpiece. Alternatively head working brushes can be placed on the engine shaft using an angle gearbox, provided as accessory. The movement of the brush unit, shown with arrows in Figure 5, is carried out using an engine and an adaptor which move a pinion on a rack resting on linear guides.
The movement of the whole unit is controlled by an inverter and the operator can change its speed through a potentiometer placed on the control panel in the centre of the equipment.
The stroke of this unit is determined by two aluminum cams that the operator can move through an hex key along the linear guide up to a maximum of 2200 mm.
The height of the work surface area can be adjusted by means of a push-button panel, so that the brush unit maintains the right work pressure on the machined component.

- Table unit: (Fig.4; detail 02 of Fig. 5; detail 05 of Fig. 7) it is designed to perform two possible movements.

A first vertical movement it is done by an engine and an adaptor acting on a pinion and a rack with a maximum stroke of 660 mm. This solution allows to work on furniture already assembled.
The operator adjusts this movement using the buttons on the control panel in the centre of the equipment.
When the work is done using the brush unit, the working pressure on the workpiece is adjusted according to the working plane height. A second movement along the width of the work table is manually controlled by the operator through an handle placed on the table edge. This allow to cover the whole surface of the workpiece together with the movement of the brush unit or during the work performed with the abrasive belt.
[0007] The machinery agrees with the Machinery Directive of the DIRECTIVE 2006/42 / EC and is equipped with appropriate safety systems related both to the presence of moving parts and to the suction systems.
Actually the machinery is equipped with metal protectors to prevent contact between the operator and the moving parts. These protections affect the abrasive belt, the brush unit and the driving pulleys.
Moreover an emergency stop button (mushroom head button) is placed on the control panel. It allows to stop the machinery and block all the operations.
The machinery is also equipped with an emergency cord with a locking mechanism similar to the emergency button. The cord is placed in front of the operator along the main working line. When the cord is pulled, the safety switch is immediately activated and the machinery is stopped.
The suction system is composed by two suction nozzles connected to the intake system installed the production site. The two nozzles are placed on the driving pulley and on the brush unit.

R. 42 (1) (d)

Brief description of drawings

[0008] Figures 1-7 shows the main characteristics of the machinery:

Fig.1: machinery overview and main dimensions

Fig.2: view of belt unit and main dimensions

Fig.3: view of brush unit and main dimensions

Fig.4: view of table unit and main dimensions

Fig.5: Overall view (detail n.01: belt unit, detail n.02: brush unit, detail n.03: table unit) and indication of the brush movement

Fig.6: side view of machinery and indication of the brush movement (detail n.04)

Fig.7: table unit view and indication of suitable movement (detail n.05)

R. 42 (1) (e)

Description of at least one way of carrying out the invention

[0009] The invented machinery can be used for surface treatments like sanding, glazing, smoothing, polishing, etc. of many materials including glass, metal, plastic, aluminum, brass etc. Particular attention is paid to the wood material and the creation of High Gloss Finish treatment (super deep gloss).
As described in the chapter (R.42(1) (b)) related to the state of the art, there are no machinery that can meet the needs of artisans who treat small volume of material within the framework of the manufacturing process mentioned above. It happens especially for High Gloss Finish.
For such a process, the small company usually turns to large specialized companies or alternatively use single portable machines.
This is the niche market where the new machinery is positioned by creating a good mix between manual and automatic process.
The new machinery combines the advantages of manual and automatic work, the first characterised by the supervision of the operator who controls any defects and im-

pefections on the workpiece that need to be once more worked (feature that cannot be done in the automatic line), the second guarantees the homogeneity of the work such as a smooth blemish-free finish.

[0010] The working steps performed by the single machinery therefore become:

A - Levelling with transversal abrasive belt (Figure 2 and detail n.01 of Figure 5): the process is made with the belt appropriately chosen for the finishing work that has to be realized, with the buffer moved using a lever.
Thanks to the lights placed on the equipment, the operator maintain the horizontality on the painted surface by passing even more times where necessary while the belt is moving with constant speed. Moreover the movement of the table unit allows to work on the whole length of the panels.

B - Smoothing: it is realised using the brush unit (Figure 3 and detail n.02 of Figure 5) and it is done uniformly respect to the same operation realised by manual machining.
The uniform movement obtained by the process automation avoids the creation of waves on the smooth surface, a typical imperfection that characterises the manual worked panels.

C - Polishing: the application of the angle gearbox, installed on the brush unit, allows the use of foam brush and Polish paste or head working brushes.

This operation allows to obtain an high quality product due to the uniform and automatic movement of the machine. Finally the quality of the product results higher to the quality achieved with the manual finishing work.

[0011] The production obtained with the new machinery is about 30 square meters per day (8-hour cycles), that is, in term of surface, the equivalent panels used in about 2 or 3 kitchens. The quality of the finished product is higher than the quality of the product made with portable equipment. Moreover it is so far better than the product obtained with the automatic line (which is not yet economically suitable for small companies), just because once the operator identify an imperfection he can eliminate it by processing the panel once again. Imperfections cannot be identified in a process done with the automatic line.
On the contrary, in this machinery the three processes are carried out with the constant supervision of the operator. This is essential in order to obtain a good finished product. Actually the final quality depends on the correct execution of each stage.
It is worth pointing out that in many countries where High Gloss Finish has not yet arrived or it is going to arrive, this machinery can be used as start up and training equipment.

Claims

1. The semi-automatic machinery for the finishing work applied to wood panels or other material panels is made up of three main components:

   Belt unit (Figure 2). It is composed by an abrasive belt moved using an electric motor with variable speed control; the belt unit is manually pressed by means of a buffer. This unit allows the sanding and levelling of the workpiece.
   Brush Unit (Figure 3). The brush unit is able to accommodate any type of brush that works tangentially. By means of an angle gearbox it is also able to receive those that work vertically (by head). The movement is carried out by a rack pinion system powered by an electric motor with variable speed control.
   Table unit (Figure 4). The work table is made up in order to allow two different movements. The vertical movement help to adjust the height in order to process panels with different thickness. Moreover the operator can adjust the work pressure of the brush unit on the workpiece. The horizontal movement of the table, manually controlled, allows the piece to be worked by the brush unit and the abrasive belt in all its parts. In this way the workpiece does not need to be moved or replaced interrupting the manufacturing process.

2. On the basis of Claim 1, the new designed machinery allows to make the High Gloss Finish treatment (super deep gloss) usually composed by three stages performed by different machines. Such stages characteristic of the mentioned process (sanding, smoothing and polishing) are then made by using a single machinery rather than three different machines.

3. The use of such innovative machinery addressed to the High Gloss Finish, as described in Claim 2, allows small and medium-size companies to carry out the mentioned treatment. Actually the investment to purchase the machinery is economically suitable for them. Nowadays an artisan has to ask to a big company for High Gloss Finish because it is realized through automatic lines using a single-work machine. If such a treatment is made manually using for example portable equipment a poor quality work is obtained.

4. The new machinery based on the features and operating modes described in Claim 1 and Claim 3, is able to perform a work that combines the regularity guaranteed by the automatic machines and the operator's ability to evaluate and recognize the anomalies during the working process. In this way the op-

erator can decide to process again the workpiece.

5. The innovation of the machinery, described in Claim 4, is also related to the better quality of the finished product that is achieved by the automatic process, under strict supervision of the operator.

6. With reference to the Claim 1, the height adjustment option allows the machinery to perform the work not only on wood panels but also on already assembled furniture. Moreover the versatility of the machinery allows to work on panels of different material such as plastic, aluminium, brass and metals in general.

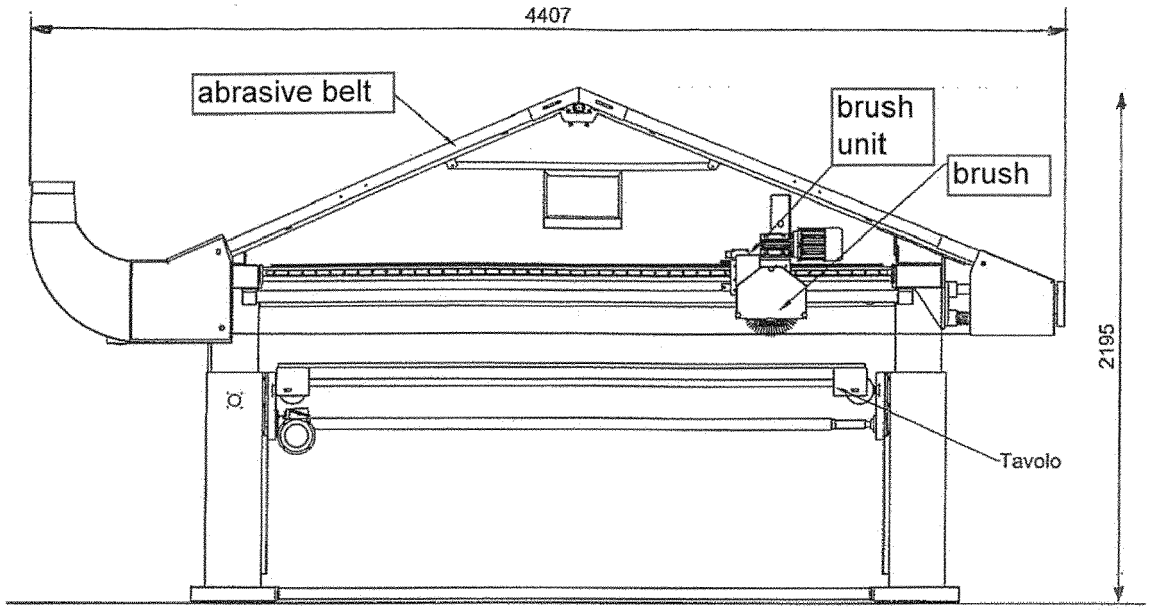
4407
abrasive belt
brush unit
brush
2195
Tavolo

Fig. 1

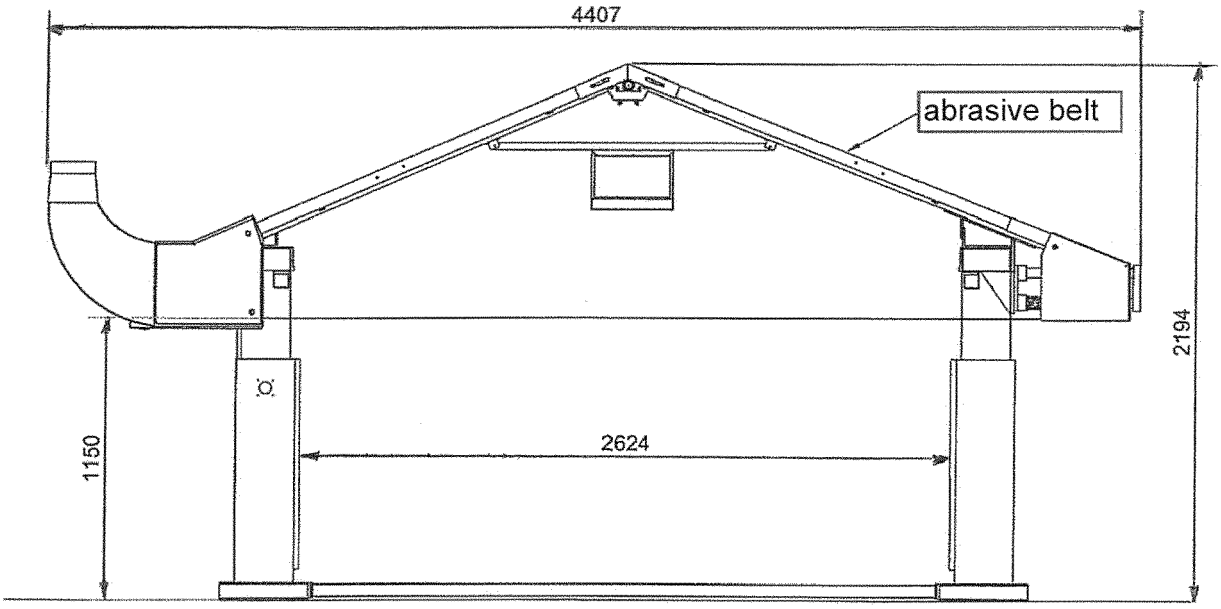
4407
abrasive belt
2194
1150
2624

Fig. 2

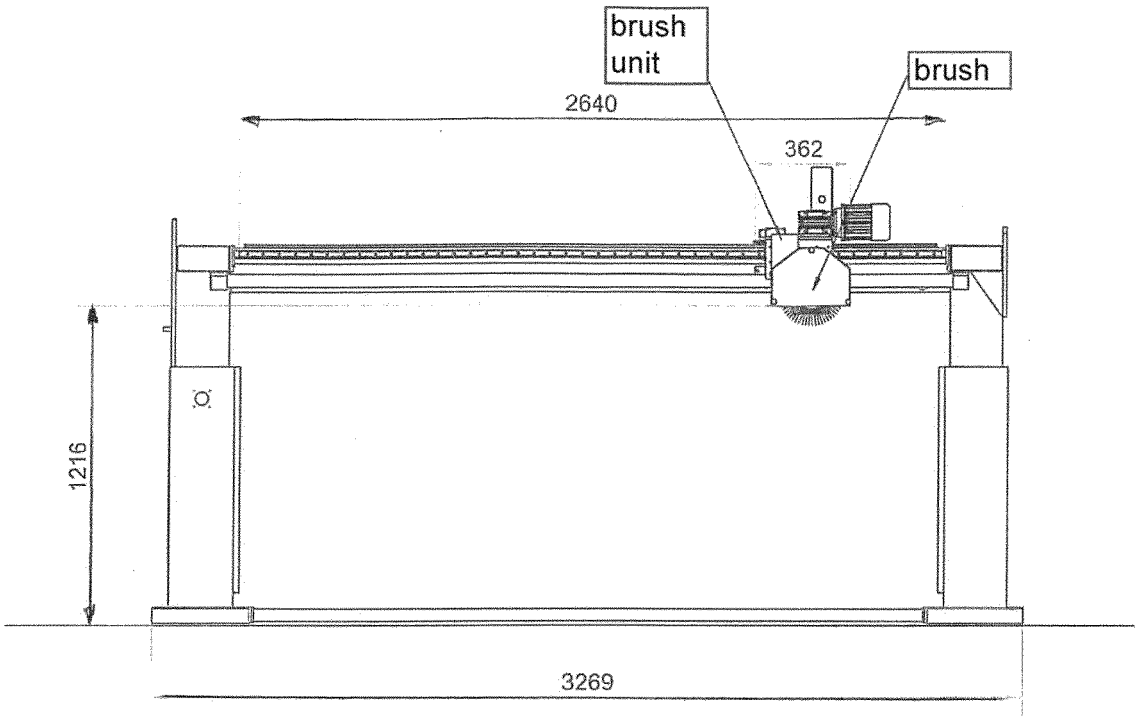

Fig. 3

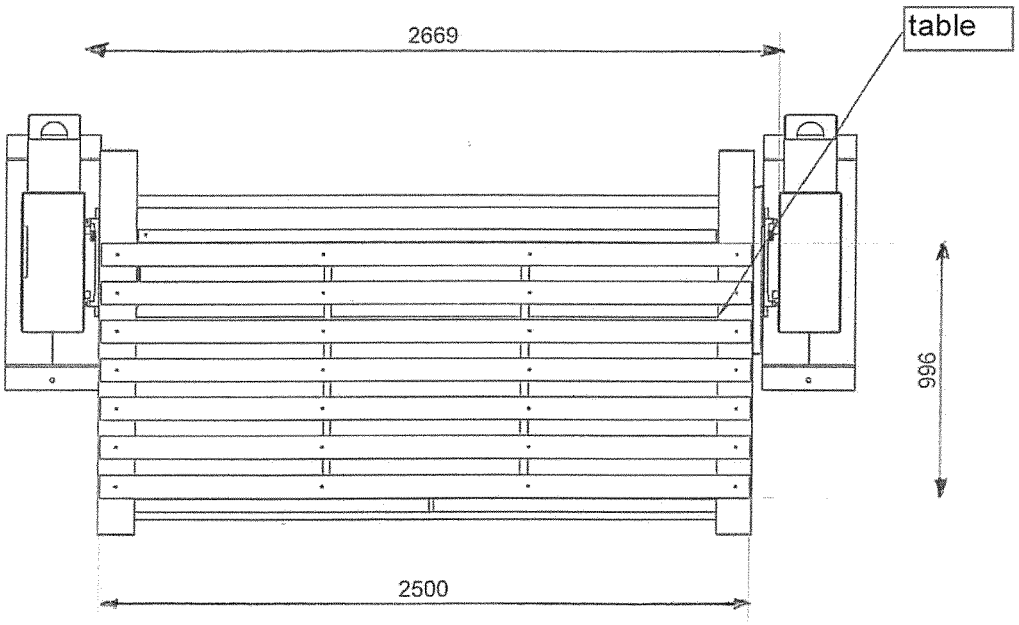

Fig. 4

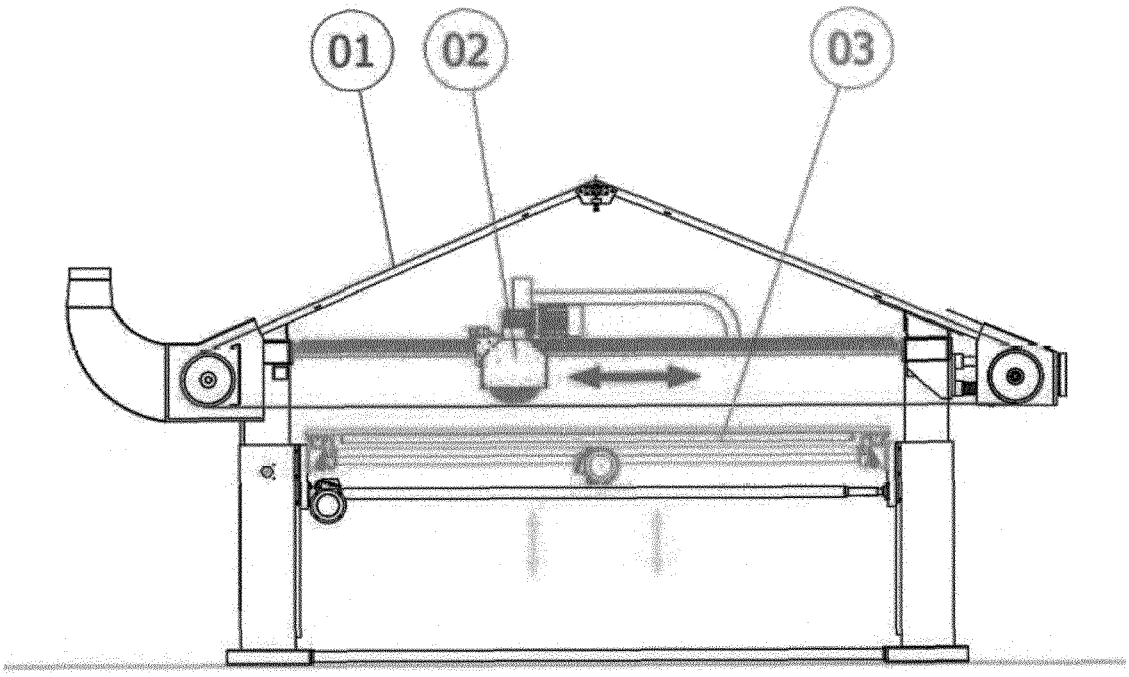

Fig. 5

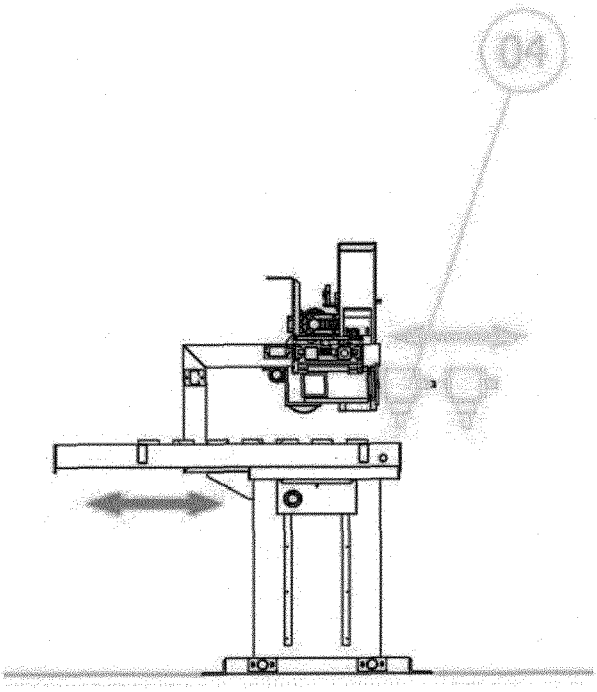

Fig. 6

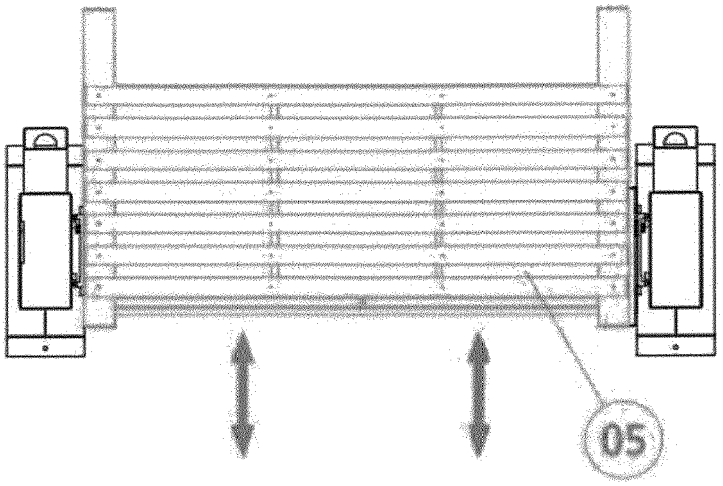

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 18 42 5002

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TECHNICAL FIELDS SEARCHED (IPC)
B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 June 2018	Koller, Stefan

CATEGORY OF CITED DOCUMENTS

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