

METHOD OF GLUEING AND DEVICE THEREOF

The present invention relates to a method of continuous, even application of adhesive and/or hardener to materials, such as wood, plastic or metal, having different dimensions, such as for example wooden lamellae in the production of furniture. The method of the invention comprises continuous even spreading of adhesive and/or hardener on the surfaces of the pieces which shall be joined by gluing. The invention also relates to a device for carrying out the method.

The simultaneous spreading of adhesive (as used hereinafter in the disclosure, the term "adhesive" is intended to embrace one-component adhesive, one or both of the components of a two-component adhesive, i e, adhesive component and/or hardener component) on the surfaces of at least one side of pieces to be glued together by means of a rotating roller is a method of common practise. The adhesive can be applied to the upper surface or the lower surface (one side adhesive application), or both surfaces (double side adhesive application), of the materials to be glued together.

Roller spreaders for one side and double side adhesive application, respectively, are conventionally known in the art. A roller spreader for one side adhesive application can be comprised of a feeding roller, an applying roller, and a doctor roller, such as described in, for example, EP-A-0 550 918, and also shown in Fig 1 herein.

The doctor roller provides means for close regulation of the glue spread. The surface of the applying roller exhibits grooves. For instance, if the applying roller is provided with groovings adapted for 150 g/m^2 , it is possible to adjust the glue spread by $\pm 10 \text{ g/m}^2$ by means of the doctor roller. There are also roller spreaders having an adhesive tray instead of a doctor roller. In either case, the distance between the applying roller and the doctor roller, and the adhesive tray, respectively, is regulated for adjusting the glue spread. In order to obtain the proper glue spread, it is essential that the correct grooving of the applying roller is chosen.

Variations in thickness of the material or between different pieces to which adhesive is to be applied are typically about $\pm 0.5 \text{ mm}$. In order to obtain an even, continuous spreading of the adhesive over the whole surface, it is essential that the material continuously is being in contact with the applying roller. This can be accomplished by the exertion of a force on the material against the applying roller. In the one side adhesive application operation this pressure can be achieved by means of adjusting the distance between the applying roller and the feeding roller (the latter not being in contact with the adhesive), and in the case of the double side adhesive application operation, by means of the distance between the applying rollers. Also, as to the former type of adhesive ap-

plication, when no feeder roller is used, merely the gravitational force of the pieces themselves can be utilised, however insufficient, by having the applying roller positioned such that the plane of the uppermost surface of said roller is located slightly above the plane of the conveying/feeding device, such that, when passing through the roller spreader, the
5 pieces will rest against the applying roller. However, in this case, the pieces might tend to tip and/or tilt.

In the production of glued components made of wood, especially parts of furniture, a number of lamellae of different height-dimensions (or width-dimensions, in the glued product, when the lamellae are pressed together) are assembled to an aggregate
10 to be glued together. An example of such production is the production of chair seats, having for example the length and width of 600 and 500 mm, respectively. These seats may comprise 5 to 15 lamellae having varying width but with the same length of 600 mm. The width of the seat is 500 mm but can be made up of 5 up to 15 lamellae. These furniture components are glued together, for example, in a hot press, cold press or high frequency line.
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The continuous application of adhesive takes place on the lower surfaces of the lamellae utilising the one side adhesive application. The lamellae are placed on the feeder device of the adhesive spreader, with the surfaces onto which adhesive is to be applied facing down, and with their length aligned in the feeding direction, and are conveyed over the applying roller. Since the lamellae are of different height and thickness
20 dimensions, they will also have different weights, and consequently, for some pieces, the weight thereof will not be sufficient to bring said pieces into continuous, intimate contact with the adhesive on the application roller, thereby jeopardising the continuous even application of adhesive, leaving areas of the lower surfaces to which adhesive has not been
25 applied, or only insufficiently applied. As a result, an uneven or discontinuous glue spread will be obtained, and large production quantities will have to be discarded. As most pieces of material, especially wooden material, not exhibit a perfect shape, but instead very often, at least to some extent, are bent and/or twisted, the above problem frequently arises.

30 Thus, in order to obtain an even, continuous coating of adhesive, the conventional roller spreader of the above type, having a feeder roller, allows for continuous applying of adhesive to materials, having different dimensions only within a narrow interval, such as ± 0.5 mm. When the dimensional variations are greater, and thus no feeder roller can be used, the problem of uneven discontinuous spreading of adhesive, together with
35 tilting of the pieces to be glued, arises, leading to inferior products and extensive discarding. Tilting is obtained as a result of inadequate sideways stability of the pieces in the

desired upright direction, throughout the adhesive spreading operation. As a conventional approach to the problem of inadequate glue spread has been to raise the height level of the uppermost surface of the application roller in relation to the feeder device in order to assure a proper contact of the pieces with the adhesive, the problem of tilting thereby at same time is increased. Further, as a result, also the risk of tipping of the pieces in the feeding direction is increased.

Brief description of the invention

10 The present invention accordingly provides a method, and a device for carrying out the method, by which the above-mentioned problems are overcome. The method according to the present invention, provides a continuous even application of adhesive and/or hardener to pieces of material of different height-dimensions. It comprises a continuous feeding of said pieces through a roller spreader and a continuous applying of
15 adhesive and/or hardener, to at least one of the surfaces of said pieces. The pieces of material are fed between at least one pressure exerting roller comprising a cylinder provided with flexible bristles, and one or more applying rollers, which are provided with the adhesive and/or hardener, to be applied to the surfaces, whereby said adhesive and/or hardener is/are applied evenly to the surface(s) of said material.

20 Preferably the flexible bristles are bending upon contact with the surface of all the pieces of the material of different height-dimensions, resulting in an even application of adhesive and/or hardener to said pieces. The cylinder provided with flexible bristles, suitably has a width exceeding the width of the pieces of the fed material, providing sideways stability to said pieces.

25 Suitable adhesives for use in the present invention can be selected from urea-formaldehyde adhesives, melamine-urea-formaldehyde adhesives, phenol-resorcinol adhesives, polyvinyl acetate based adhesives, emulsion polymerisation-isocyanate adhesives, and polyurethane adhesives.

 The device according to the claimed invention, used for carrying out a
30 simultaneous, uniform, continuous, application of adhesive and/or hardener to pieces of material, having different height-dimensions in relation to each other, comprises means for feeding said pieces of material, one or more applying rollers, and means for supplying adhesive and/or hardener to each of said applying roller(s). It comprises at least one flexible, pressure exerting roller comprising a cylinder provided with flexible bristles,
35 wherein the means for feeding are arranged to feed said pieces of material between the pressure exerting roller(s) and the applying roller(s).

The pressure exerting roller and the applying roller can be arranged at such a distance from each other, so that the flexible bristles are bending upon contact with the surface of all the pieces of the material of different height-dimensions. Furthermore, the claimed device comprises means for independently regulating the speeds of the applying roller(s) (240) and the pressure exerting roller(s).

Brief description of the drawings

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Fig. 1, is a schematic side view representation of a conventional roller spreader for one side adhesive application, in which reference numeral 100 designates a feeding roller, 110 an applying roller, and 120 a doctor roller, 130 adhesive, and finally 140, the pieces on to which adhesive is to be applied.

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Fig. 2 is a side view of an embodiment of the roller spreader according to the invention, provided with a flexible, pressure exerting roller 260, a doctor roller 250, and also means for feeding 210, 215 the material 200 in to and out from, respectively, said roller spreader.

Fig. 3 is a front view of the embodiment shown in Fig. 2.

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Detailed description of the invention

Figures 2 and 3 show one embodiment of the claimed invention and are not meant to limit the scope of the claimed invention.

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The method of the present invention will be described more closely with reference to Figures 2 and 3 hereinafter. The method of the invention comprises simultaneous application of adhesive to the pieces of material 200 of different dimensions, for instance comprising wooden lamellae 205, by means of the roller spreader including one or more flexible, pressure exerting roller(s), according to the invention, which lamellae thereafter can be pressed together, for example, to form a glued product, such as block wood or laminated timber, or to form components of furniture.

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With reference to Fig. 2, the method is carried out by supplying the material to be glued 200, such as for example wooden lamellae, to a roller spreader according to the invention (shown together with conveying means 210, 215), applying adhesive 290 to the lower surfaces 207 of the materials by means of the application roller 240, and continuously removing the pieces exiting the roller spreader by means of conveying belt 215.

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The materials to be glued 200 are fed to the roller spreader by means of conveying belt 210 to the roller spreader. The roller spreader shown in Fig. 2 according to the invention comprises an application roller 240, a doctor roller 250, to which adhesive 290 is supplied, and a flexible, pressure exerting roller 260.

5 Thereafter, the pieces of material could be turned 90° around the length axis of each lamella, and an additional lamella 209 shown in Fig. 3, having no adhesive applied thereto is also provided, which is to be brought into contact with the unpaired remaining exposed adhesive coated surface, said pieces and the additional lamella forming components of furniture, which are subsequently pressed together in hot press, cold press, or
10 frequency press lines, for example.

The length of the lamellae can, for example, range from 50 cm to 4 m.

As can be seen from Fig. 2 and 3, the flexible, pressure exerting roller of the
15 invention 260 comprises a cylinder 270 provided with bristles 280.

The doctor roller 250, which can be seen in Fig. 2, could also be substituted with an adhesive tray, optionally along with an adhesive transfer roller. Thus a doctor roller 250, an adhesive tray, or an adhesive tray together with an adhesive transfer roller, independently can be used with each of the one or more applying rollers for supplying of
20 adhesive and/or hardener. However, the means of supplying adhesive to the application roller is not restricted in any way as long as the amount of adhesive feed can be suitably regulated.

According to the present invention, an even, continuous spreading of adhesive on the surfaces to be glued is obtained by means of the bristles 280 exerting a pressure
25 against the application roller 240 on each of the pieces to be glued, and at the same time also providing a support essentially parallel to the sides of the pieces as can be seen in Fig. 3. Furthermore, tilting and tipping is avoided since the upper surface of the applying roller 240, and of the conveyer belt 210, 215 preferably can be provided in essentially the same plane.

30 The speed of the applying roller 240 and the flexible, pressure exerting roller 260, respectively, can each be independently regulated in order to obtain the proper feeding of the material through the roller spreader. The speed of the material through the roller spreader can for example be about 20 to 50 m/min, typically about 30 m/min. The distance between the applying roller and the flexible, pressure exerting roller can also be
35 regulated by adjusting the positions of the rollers, preferably that of the pressure exerting roller(s), to obtain a suitable distance between the rollers, so as to achieve a required

minimum pressure on the pieces of material, thereby assuring continuous even contact of the lower surfaces of the pieces with the adhesive on the applying roller.

Suitably, the bristles should be in contact with the smallest piece to such an extent that said bristles are bent somewhat against the upper surface of said piece, and as
5 a suitable example, the bristles can overlap about half the height of said piece upon passage of the piece through the roller spreader.

The flexible, pressure exerting roller is commercially available and comprises a brush roll which can accommodate dimensional differences in height of the material of up to about 100 mm, suitably up to about 50 mm. Said brush roll should also be as soft and
10 compliant as to not undesirably affect the speed of the lamellae in the feeding direction. The width of said brush roll should preferably be extending the width of the pieces of the fed material, providing side stability to said pieces (see Fig. 3). A suitable diameter of such a brush roll can for instance be about 300 mm. Preferably the width of the brush roller is about the same as the application roller.

15 The flexible material of the brush roll of the invention may comprise bristles 280, such as shown in Fig. 2 and 3, for example made of polyamide, or other plastic material such as polypropylene, or spring steel, glass fibres or natural fibrous material, provided in a direction extending essentially radially from the centre of the rotational axis thereof. The cross-section of said bristles can be round, square or rectangular, or another suitable
20 geometric shape. The diameter of the bristles can range from about 0.1 mm to about 2.0 mm, and the length thereof from about 100 mm to about 300 mm. The specific type of bristles used and the material thereof is not critical as long as the required elasticity is obtained. The material of the cylinder 270 can be for example a metallic or plastic material, such as polyethylene.

25 A suitable brush roll can be comprised of, for example, polyamide bristles of 1.5 mm diameter, provided in bundles attached to the cylinder 270, having axially, along the length of said cylinder, the distribution of 7.5 mm of bristles with a distance of 10 mm between two neighbouring bundles. The spacing between two adjacent bundles can be about 2 - 10 mm in any direction. Around the periphery of a cylinder 270 having the outer
30 diameter of 80 mm, for example, there can be provided 22 bundles.

Optionally, or if required, there can also be provided additional means for preventing tilting in combination with the present invention, such as a pair of brush rollers arranged in a "V"-shape with the tip of the "V" facing the exit side of the roller spreader, or for example a pair of spring loaded arms resting against the outermost sides of the
35 pieces being glued.

It is to be understood that the roller spreader according to the invention, while described herein with reference to embodiments thereof incorporating only one application roller and one flexible, pressure exerting roller, also can incorporate two or more of the above-mentioned rollers, the numbers of which can be chosen independently from each other.

Examples of adhesives encountered in the wood processing industry, which can be used in combination with the present invention are, for example; urea-formaldehyde adhesives, melamine-urea-formaldehyde adhesives, phenol-resorcinol adhesives, polyvinyl acetate based adhesives, emulsion polymerisation-isocyanate adhesives, and polyurethane adhesives.

While described herein with reference to adhesive, it is to be understood that, in addition to the above-mentioned adhesives, the roller spreader of the present invention can, for instance, also be used for separate application of hardeners (as included in the definition of "adhesive" hereinbefore) of two-component adhesives to pieces, onto which pieces a corresponding adhesive component subsequently is to be applied. The hardener may, for instance, be a hardener suited for curing an aminoresin based or formaldehyde based adhesive. The hardener may also be in a mixture with the adhesive and be applied to the pieces as such.

The surface material of the applying roller provided with groovings can be any suitable conventional material, such as steel, rubber or plastic, which is sufficiently inert in relation to the particular adhesive or hardener to be applied.

The material of the pieces to which application of adhesive or hardener according to the invention is intended, can also, in addition to wooden material, be for example any suitable plastic or metallic material.



1. Method for continuous even application of adhesive and/or hardener (290) to pieces of material of different height-dimensions (205), comprising continuous feeding of
5 said pieces through a roller spreader and continuous applying of adhesive and/or hardener, to at least one of the surfaces (207) of said pieces, c h a r a c t e r i s e d in that said pieces of material are fed between at least one pressure exerting roller (260) comprising a cylinder (270) provided with flexible bristles(280), and one or more applying rollers (240), which are provided with the adhesive and/or hardener, to be applied to the
10 surfaces, whereby said adhesive and/or hardener is/are applied evenly to the surface(s) of said material.

2. The method according to claim 1, c h a r a c t e r i s e d in that the bristles are bending upon contact with the surface of all the pieces of the material of different height-dimensions.

15 3. The method according to claims 1-3, c h a r a c t e r i s e d in that the cylinder provided with flexible bristles, has a width exceeding the width of the pieces of the material, providing sideways stability to said pieces.

4. The method according to claim 1 or 2, c h a r a c t e r i s e d in that the speeds of the applying roller(s) (240) and the pressure exerting roller(s) (260) are
20 regulated independently.

5. The method according to any of the previous claims, c h a r a c t e r i s e d in that an adhesive selected from urea-formaldehyde adhesives, melamine-urea-formaldehyde adhesives, phenol-resorcinol adhesives, polyvinyl acetate based adhesives, emulsion polymerisation-isocyanate adhesives, and polyurethane adhesives,
25 is used.

6. Device for simultaneous, uniform, continuous, application of adhesive and/or hardener to pieces of material, having different height-dimensions in relation to each other, comprising means for feeding (210, 215) said pieces of material, one or more applying rollers (240), and means for supplying adhesive and/or hardener (290) to each
30 of said applying roller(s), c h a r a c t e r i s e d in that it comprises at least one flexible, pressure exerting roller (260) comprising a cylinder (270) provided with flexible bristles(280), wherein the means for feeding are arranged to feed said pieces of material between the pressure exerting roller(s) and the applying roller(s).

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7. The device according to claim 6, c h a r a c t e r i s e d in that the pressure exerting roller and the applying roller are arranged at such a distance from each other, so that the flexible bristles are bending upon contact with the surface of all the pieces of the material of different height-dimensions.

5 8. The device according to claim 6 or 7, c h a r a c t e r i s e d in that it comprises means for independently regulating the speeds of the applying roller(s) (240) and the pressure exerting roller(s) (260).

 9. The device according to any of the claims 6-8 , c h a r a c t e r i s e d in that the cylinder provided with flexible bristles, has a width exceeding the width of the pieces
10 of the material, providing sideways stability to said pieces.

 10. The device according to any of the claims 6-9, c h a r a c t e r i s e d in that said bristles (280) can accommodate differences in height-dimensions of said pieces of up to about 100 mm.

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