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(54) Benævnelse: **FREMGANGSMÅDE TIL FREMSTILLING AF ET LAMINAT TIL EN GULVBELÆGNING**

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PROCESS FOR PRODUCING A LAMINATE FOR A FLOOR COVERING

Description

The invention relates to a method for producing a laminate preferably for a floor covering.

A method for producing a floor panel is known from EP 1 262 607 B1. In this case, a laminate, consisting of a wear layer, a decorative layer with a decorative paper and a polyurethane layer applied to the reverse of the decorative paper are laminated onto a hard substrate such as MDF or HDF. In one exemplary embodiment, the wear layer is made of a UV-curable polyurethane varnish. Due to the soft, damping polyurethane layer between the decorative layer and the hard substrate, such a laminate floor panel has comparatively good noise reduction. In this case, by means of the polyurethane varnish, unlike hard wear layers made of melamine, the wear layer can follow the deformation of the decorative paper and the damping polyurethane layer.

However, production of the polyurethane laminate described above has proven difficult. For example, when curing the polyurethane in the wear layer, air or vapour pockets can form, which are detrimental to the transparency of the wear layer and, thus, the aesthetic effect of the decorative layer. It has also been demonstrated that, despite the use of mineral particles in the wear layer, the desired wear resistance cannot be achieved. It is also difficult to design and control the supply of heat necessary for targeted curing of the polyurethane during the production process such that the laminate satisfies all the established quality requirements.

Therefore, the aim of the invention is to provide a method for producing a polyurethane-based laminate, wherein simple production of a high-quality laminate is rendered possible by the method.

The underlying aim of the invention is achieved with the combination of characteristics according to claim 1. Exemplary embodiments of the invention are apparent from the dependent claims.

In the method according to the invention, a first liquid polyurethane material is applied to a release layer to form the wear layer. A decorative sheet is inserted into this first polyurethane material, wherein using appropriate means, such as for example a soft roller, this insertion can be performed with a certain pressure. After inserting the decorative sheet into the first polyurethane material, a second liquid polyurethane material is applied to the decorative sheet (or to the first polyurethane material). The

decorative sheet is impregnated with the first polyurethane material and the second polyurethane material. In this case, impregnation of the decorative sheet is performed from two sides, namely, on the one hand, from the side of the decorative sheet facing the release layer, which can also be referred to as the upper side, as it faces upwards in the use position of the laminate. On the other hand, impregnation is performed from the side of the decorative sheet onto which the second polyurethane material has been applied (also referred as the lower side of the decorative sheet).

Heat energy is supplied to cure the first polyurethane material and the second polyurethane material. The first polyurethane material preferably comprises at least two components, the reaction of which with each other results in curing of the polyurethane material. The reaction can be accelerated or controlled by supplying the heat energy.

Following at least partial curing of the first polyurethane material, the release layer is separated from the wear layer formed by the first polyurethane material. According to the invention, provision is made for the heat energy to be supplied to the first polyurethane material and the second polyurethane material from below through the release layer. The production process can be controlled very precisely as desired by this kind of heat supply, such that a high-quality laminate can be produced.

The laminate can be used, in particular, as a floor covering or as a component of a floor covering. However, it can also be used as a wall or ceiling covering.

In one exemplary embodiment, the heat energy is supplied exclusively (100 %) from below through the release layer. This means that there is no further external energy input, by means of which curing of the polyurethane materials is controlled or accelerated. In this case, the external energy yield is separated from the natural energy input (heat, possibly UV radiation, etc.) by the environment, in which the method takes place. In an alternative exemplary embodiment, the energy component from below through the release layer is more than 80 %, wherein, the remaining 20 % for curing is provided from above, for example by radiators.

The release layer can rest on at least one hotplate, the temperature of which, in a preferred exemplary embodiment, is lower than 100° (degrees Celsius). A temperature level for the hotplate of 70 to 100°, preferably 75 to 90°, has proved to be particularly favourable for the method. At this temperature level, water can be used as an energy transfer medium for heating the hotplate, which can be fed through the hotplate without pressure, apart from the pump pressure for circulating the water. This simplifies the

design of the hotplate and the connection of the hotplate to a boiler or the like. Other heat transfer media, such as for example oil, can also be used for heating the hotplate.

A separate reinforcing sheet can be placed on the decorative sheet, which, similar to the decorative sheet, is impregnated with the first polyurethane material and/or the second polyurethane material. In this case, the separate reinforcing sheet is preferably placed on the decorative sheet, before the second polyurethane material is applied to the decorative sheet. This results in the following layer structure when viewed from above, from the release layer and, thus, in the use position of the laminate:

- first polyurethane material, which forms the wear layer,
- decorative sheet,
- reinforcing sheet,
- a reverse layer made of the second polyurethane material.

The decorative sheet and the reinforcing sheet are preferably impregnated with the first polyurethane material and the second polyurethane material, such that the boundaries between the first polyurethane material and the decorative sheet, as well as between the reinforcing sheet and the second polyurethane material are fluid. This means that, even when using the reinforcing sheet, the second polyurethane material can penetrate as far as the decorative sheet and can contribute to impregnation there. The same applies accordingly to the reinforcing sheet. This can preferably also be impregnated by both the second polyurethane material, as well as by the first polyurethane material. The common impregnation of decorative sheets and reinforcing sheets, in each case from two sides, results in a composite, which has good tear and bond strength in a direction perpendicular to the surface expansion of the individual layers.

The reinforcing sheet is preferably made of glass mat. Alternatively or additionally, a glass fabric can also be used. The mat and/or the fabric can also be made of other reinforcing materials.

In a preferred exemplary embodiment, the decorative sheet, the reinforcing sheet (where provided) and the release layer are each moved as a continuous sheet over the hotplate or moved over a plurality of hotplates connected one behind the other. The laminate can thus be produced continuously in an endless process. The individual hotplates can preferably be supplied individually with heat energy, such that, for example, they are powerfully heated differently and have different temperature levels. The individual materials or sheets are preferably applied or placed - viewed in the direction of

movement at a certain distance - above the hotplates. Thus, a targeted heat supply can be adjusted for each application or placement.

The release layer can be held by negative pressure on the hotplate. In this case, the negative pressure must be adjusted such that the tensile forces needed to move the release layer relative to the hotplate are not too great and tear the release layer. The release layer is not only maintained in the desired position or the desired path by means of negative pressure. Negative pressure also ensures direct contact between the release layer and the hotplate, which ensures a good heat transfer from the hotplate to the release layer. As a result, the heat, which is passed through the release layer and cures the first polyurethane material and the second polyurethane material, can be reliably and precisely adjusted.

In one exemplary embodiment, the release layer has a surface structure for forming an outer surface of the wear layer having a corresponding (negative) surface structure.

For example, for a decorative sheet, on which a wood finish is printed, the release layer can be stamped such that its surface structure has small elevations, which results in corresponding small indentations in the outer surface of the wear layer, in order to imitate wood pores. In principle, the type, size, distribution and arrangement of the individual elevations or indentations in the surface structure of the release layer can be freely chosen, wherein, however, they preferably correlate to the printed image of the decorative sheet. Thus, in one exemplary embodiment, an elevation in the release layer and a graphic feature of the decorative sheet can be precisely aligned with each other. In this way, the surface structure of the outer surface of the wear layer can thus reinforce the aesthetic effect of the decorative sheet. This results in a laminate with an outer surface, which has precisely aligned surface features. Such an alignment of the surface structure and printed image is comparable with known EIR technology (Embossed-In-Register or synchronous pore).

Before the decorative sheet is inserted, mineral particles can be scattered in a dry form onto the first polyurethane material. The mineral particles preferably comprise corundum particles with a particle size of 30 to 80 µm. The first polyurethane material should preferably be procured such that the corundum particles do not sink down to the release layer (which can be adjusted by supplying heat energy), but rather are maintained at a certain distance therefrom in the polyurethane material. On the other hand, the first polyurethane material should also not be too viscous, as otherwise complete

impregnation of the decorative sheet could become difficult. The comparatively large corundum particles ensure very good wear resistance of the laminate. Due to the distance between the corundum particles and the release layer, the latter is not damaged. This also reduces the risk of the corundum particles preventing homogeneous pouring of the surface structure of the release layer by means of direct application to the release layer.

The first polyurethane material is preferably composed of aliphatic polyurethane components. The second polyurethane material is preferably composed of aromatic polyurethane components. It has been found that, despite the different polyurethane components, there are no disruptive boundary layers within the laminate, which too greatly affect the bond strength of the laminate.

In one exemplary embodiment, the decorative sheet is a pulp-based decorative paper. In this case, the weight per unit area can be 20 to 80 g/m2. In one exemplary embodiment, the weight per unit area is 30 to 50 g/m2.

The decorative sheet can be guided as a continuous sheet over a first heating roller, in order to reduce the residual moisture in the sheet material. In this case, the residual moisture downstream of the heating roller is preferably less than 1 percent or even 0.5 %. Alternatively or additionally, the release layer can be guided over a second heating roller, in order to keep its residual moisture as low as possible in this case too.

A third polyurethane material can be applied to the second polyurethane material. In this case, application of the third polyurethane material can only be performed when the first polyurethane material and the second polyurethane material are already (completely) cured. Alternatively, it is also possible to apply the third polyurethane material to the still liquid or only partially cured second polyurethane material.

The third polyurethane material can contain organic or inorganic fillers. Inorganic fillers may be sand, chalk, clay, minerals or glass. Wood, cork, lignin, plant fibres can be used as organic fillers, or polystyrene or granules can be used as polymer fillers.

The third polyurethane material can be applied in a quantity such as to produce a polyurethane layer, which can have a thickness of 100 to 5000 µm. This polyurethane layer can be reinforced by inserting a (further) reinforcing sheet. A non-woven or woven fabric (for example a glass mat or a glass fabric) can be used, for example. A functional sheet can be placed on the third polyurethane material to form a final functional layer. The functional layer can be a foam, a non-woven fabric or even an adhesive layer, which can be covered with a peel-off film. The functional layer can have a surface finish, by

means of which the laminate can be laid on a suitable substrate without adhesive (loose-lay method).

The functional layer or the functional sheet can also be applied/placed directly to/on the second polyurethane material. Thus, it is not absolutely necessary to provide a third polyurethane layer.

In one exemplary embodiment, the functional sheet is a cork plate, which can be placed in wound form as a continuous sheet on the second polyurethane material or on the third polyurethane material. Insertion of the cork plate is preferably performed when the second polyurethane material and/or the third polyurethane material are still liquid or at least not yet cured.

Granulated cork, which is bonded under mechanical pressure and/or vacuum bonded with a binding agent to the cork plate, can be used to produce the cork plate. Polyurethane is preferably used as a binding agent such that a good bond can be achieved between a cork plate produced in this manner (granulated cork with polyurethane as a binding agent) and the second or third polyurethane material.

The thickness of the functional sheet (cork plate) can be 500 to 5000 µm, preferably 0.75 to 2 mm.

Thus, following successful production, individual panels can be cut from the laminate, the edges of which can be provided with profiles, in order to be able to connect identically constructed panels to each other. It is also possible to laminate the laminate onto a substrate and to then cut the composite of the substrate and laminate into panels. In this case, the profiles are preferably formed into the material of the substrate (milled in, for example), wherein, in this case, the polyurethane layer made of the third polyurethane material is preferably less strongly developed (50 to 800 µm, for example) or is omitted entirely.

In one exemplary embodiment, an adhesive layer with a peel-off film is applied to the surface of the laminate facing away from the wear layer. Thus, the laminate can be stored and transported as a rolled product, despite the adhesive layer. Bonding with the substrate, for example in a separate place from the laminate's production location, can then be performed particularly simply, as a separate application of adhesive to the substrate or the laminate is not necessary.

The invention is explained in greater detail with reference to a single figure. The figure is intended to schematically illustrate the method for producing the laminate

according to the invention.

The figure provides a schematic illustration of a plurality of hotplates 10 (10a to 10f) arranged one behind the other, over which a release layer 11 in the form of a continuous sheet of release paper is guided, in order to produce a laminate 1. In the illustration in the figure, the release layer is moved from left to right, which is also illustrated by a horizontal direction of movement X. A first polyurethane material 12 is first applied from above to the release layer 11 at the level of the hotplate 10a. When applied to the release layer 11, the first polyurethane material is in liquid form. Following application of the first polyurethane material 12 to the release layer 11, dry corundum particles 13 are scattered theron. Thereafter, a decorative sheet 14 is inserted into or placed on the first polyurethane material 12 (the terms insert and place are used synonymously in this case). As the first polyurethane material 12 is still liquid when the decorative sheet 14 is inserted, impregnation of the decorative sheet 14 begins. The decorative sheet is also a continuous sheet. It is preferably made of a pulp-based decorative paper.

A vertical height of a roller 15, with the aid of which the decorative sheet 14 is fed to the already deposited layers, can be adjusted such that the decorative sheet 14 is easily pressed into the first polyurethane material 12.

A separate reinforcing sheet 16 is then placed over the decorative sheet 14, which, in this case, is formed as a continuous sheet made of glass mat. Following placement/insertion of the reinforcing sheet 16, a second liquid polyurethane material 17, which differs from the first polyurethane material 12, is applied.

The second liquid polyurethane material 17 is followed by a third liquid polyurethane material 20, which is enriched with fillers, for example. Finally, to form a functional layer, a functional sheet 21, which is fed via a roller 22, is placed on the third polyurethane material 20. No pressing of the individual layers or the laminate is performed.

Impregnation of the decorative sheet 14 and the reinforcing sheet 16 is performed both from below (primarily by the first polyurethane material 12) and from above (primarily by the second polyurethane material 17). In doing so, the degree of mixing of the polyurethane materials 12, 17 depends, on the one hand, on the permeability of the sheets 14, 16 and, on the other hand, on how viscous the materials 12, 17 are. According to the invention, the viscosity of the materials 12, 17 can be adjusted by the controlled

supply of heat, wherein the temperature of the hotplates and the feed rate of the release layer 11 can be used as control parameters.

As with the decorative sheet 14, the supply of the release layer 11 is performed via a roller, which is identified in this case as 18. A further roller, with which the reinforcing sheet 16 is redirected, is identified as 19. Further rollers, not shown here, via which the respective sheets are fed or redirected, can be heated, in order to reduce the residual moisture in the sheets. It should be noted that the figure only illustrates production in a schematic manner, such that the illustrated position of the individual, possibly heated rollers 15, 18, 19 and 21 may differ significantly from the position in an actual implementation of the method. The same applies accordingly to the distances, dimensions, etc. appearing in the figure.

After passing the last hotplate 10f, the polyurethane materials are cured such that the release layer 11 can be separated from the laminate 1 and rolled up again for further use. The laminate 1 can also be rolled up and thus stored and transported as a rolled product.

The heat energy, by means of which curing of the first polymer material 12 and the second polymer material 17 is controlled or accelerated, is supplied to the process by the hotplates 10. A heat transfer medium in the form of hot water in a temperature range of 75 to 90° flows through the hotplates 10 and heats these accordingly. The hotplates 10 release their heat through the release layer 11 to the first polyurethane material 12 and the second polyurethane material 17. The supply of hot water is hotplate-specific. This means, for example, that a different quantity of heat is released via hotplate 10f than, for example, via hotplate 10a. If, for example, the first polyurethane material 12 is still liquid when the corundum particles 13 are scattered, initial curing can be somewhat accelerated by a greater heat input from hotplate 10a.

Conversely, curing of the first polymer material should also not be performed too quickly, if at least a certain level of impregnation of the sheets 14, 16 is intended to be performed by the first polyurethane material.

Assuming that, after passing the hotplate 10e, the decorative sheet 14 and the reinforcing sheet 16 are impregnated to the desired extent, a greater quantity of heat can be supplied via the hotplate 10f, in order to rapidly complete curing.

List of reference symbols

1	Laminate
10	Hotplate (10a to 10f)
11	Release layer
12	First polyurethane material
13	Corundum particles
14	Decorative sheet
15	Roller
16	Reinforcing sheet
17	Second polyurethane material
18	Roller
19	Roller
20	Third polyurethane material
21	Functional sheet
22	Roller
X	Direction of movement

Patentkrav

1. Fremgangsmåde til fremstilling af et laminat (1) fortrinsvis til en gulvbelægning, idet laminatet (1) har et dekorativt lag og et slidlag af polyurethan, omfattende følgende trin:

- at påføre et første flydende polyurethanmateriale (12) på et frigørelseslag (11) for at danne slidlaget,
- at indlægge et dekorativt ark (14) i det første polyurethanmateriale (12),
- at påføre et andet flydende polyurethanmateriale (17) på det dekorative ark (14), som imprægneres med det første polyurethanmateriale (12) og det andet polyurethanmateriale (17),
- at tilføre varmeenergi for at hærde det første polyurethanmateriale (12) og det andet polyurethanmateriale (17),
- at adskille frigørelseslaget (11) fra slidlaget,

idet varmeenergien tilføres det første polyurethanmateriale (12) og det andet polyurethanmateriale (17) nedefra gennem frigørelseslaget.

2. Fremgangsmåde ifølge krav 1, **kendetegnet ved, at** frigørelseslaget (11) ligger på mindst en varmeplade (10), hvis temperatur er lavere end 100°C.

3. Fremgangsmåde ifølge krav 2 eller 3, **kendetegnet ved, at** der på det dekorative ark (14) lægges et separat forstærkningsark (16), som imprægneres med det andet polyurethanmateriale (17) og fortrinsvis med det første polyurethanmateriale (12).

4. Fremgangsmåde ifølge krav 3, **kendetegnet ved, at** forstærkningsarket (16) er fremstillet af glasvæv.

5. Fremgangsmåde ifølge krav 3 eller 4, **kendetegnet ved, at** det dekorative ark (14), forstærkningsarket (16) og frigørelseslaget (11) hver som en kontinuerlig bane bevæges henover varmepladen (10).

6. Fremgangsmåde ifølge krav 5, **kendetegnet ved, at** frigørelseslaget (11) ved undertryk holdes på varmepladen (10).

7. Fremgangsmåde ifølge et af kravene 1 til 6, **kendetegnet ved, at** frigørelseslaget (11) har en overfladestruktur til at danne en ydre overflade af slidlaget med en tilsvarende overfladestruktur.

8. Fremgangsmåde ifølge et af kravene 1 til 7, **kendetegnet ved, at**, inden det dekorative ark (14) indlægges, strøs mineralske partikler i tør form på det første polyurethanmateriale (12).

9. Fremgangsmåde ifølge et af kravene 1 til 8, **kendetegnet ved, at** det første polyurethanmateriale (12) er sammensat af alifatiske polyurethankomponenter, og det andet polyurethanmateriale (17) er sammensat af aromatiske polyurethankomponenter.

10. Fremgangsmåde ifølge et af kravene 1 til 9, **kendetegnet ved, at** det dekorative ark (14) er et pulp-baseret dekorativt papir med gramvægt på 20 til 80 g/m^2.

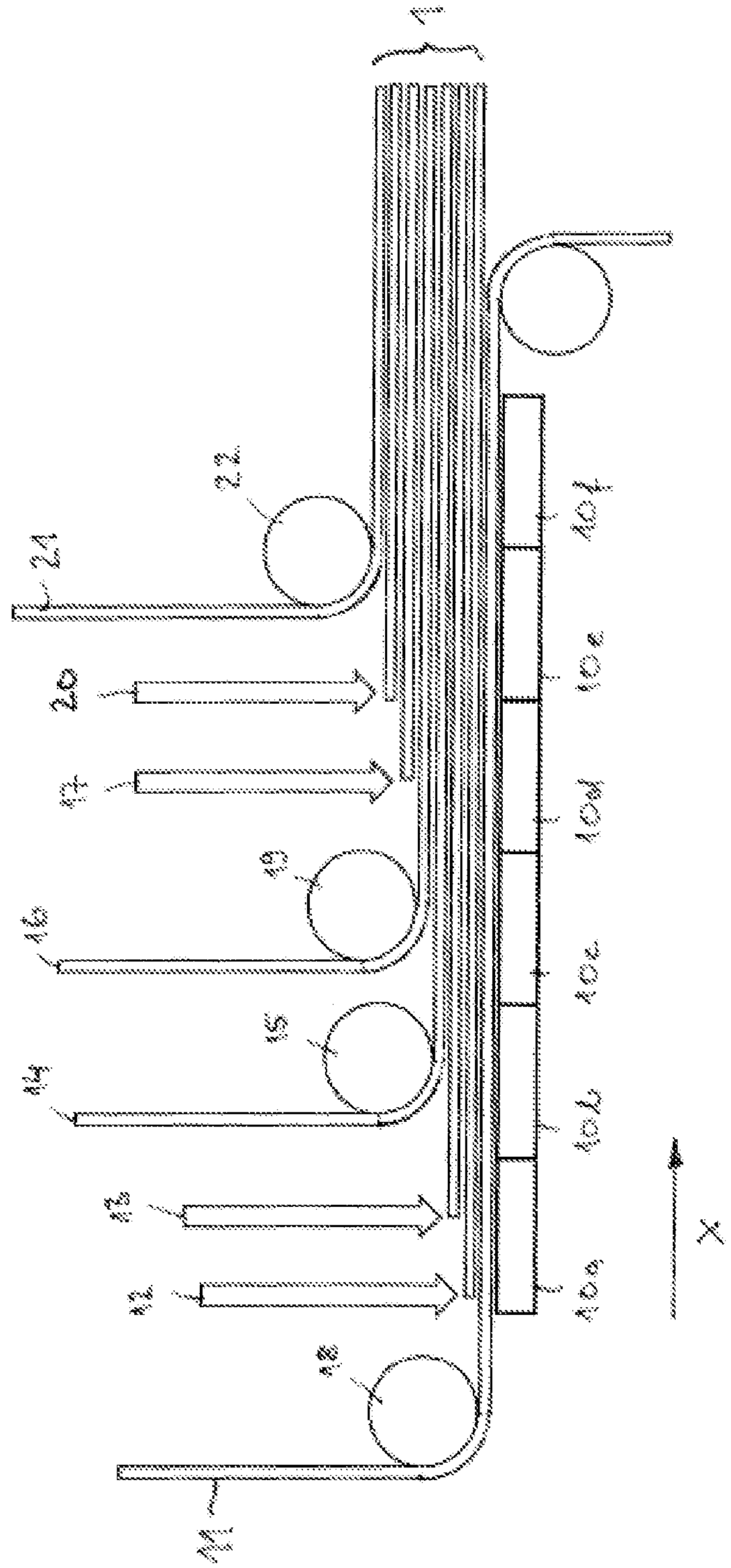
11. Fremgangsmåde ifølge et af kravene 1 til 10, **kendetegnet ved, at** det dekorative ark (14) føres som en kontinuerlig bane over en første varmevalse, og/eller frigørelseslaget (11) føres som en kontinuerlig bane over en anden varmevalse.

12. Fremgangsmåde ifølge et af kravene 1 til 11, **kendetegnet ved, at** et tredje polyurethanmateriale (20) påføres det andet polyurethanmateriale (17).

13. Fremgangsmåde ifølge et af kravene 1 til 11, **kendetegnet ved, at** et funktionsark lægges på det andet polyurethanmateriale eller på et tredje polyurethanmateriale (20).

14. Fremgangsmåde ifølge krav 13, **kendetegnet ved, at** funktionsarket er en korkplade.

15. Fremgangsmåde ifølge et af kravene 1 til 14, **kendetegnet ved, at** et klæbelag med en aftrækningsfolie påføres på en overflade af laminatet (1), som vender væk fra slidlaget.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