(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 January 2022 (13.01.2022)

WIPO | PCT

(10) International Publication Number
WO 2022/010408 A1

(51) International Patent Classification:
*B05D 5/02* (2006.01) *B44C 5/04* (2006.01)
*B05D 1/36* (2006.01) *E04C 2/24* (2006.01)
*B32B 37/24* (2006.01) *E04F 15/02* (2006.01)
*B32B 38/14* (2006.01) *B32B 21/00* (2006.01)

(21) International Application Number:
PCT/SE2021/050691

(22) International Filing Date:
07 July 2021 (07.07.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2050873-5 09 July 2020 (09.07.2020) SE

(71) Applicant: **VÄLINGE INNOVATION AB** [SE/SE]; Prästavägen 513, SE-263 64 VIKEN (SE).

(72) Inventors: **RYBERG, Melker**; Kilian Zollsgatan 11A, SE-217 56 MALMÖ (SE). **WIGBLAD, Disa**; Ringstorpsvägen 23, SE-254 54 HELSINGBORG (SE). **SLOTTEMO, Andreas**; Skimmelvägen 38, 254 83 HELSINGBORG (SE). **ZIEGLER, Göran**; Hästhovsvägen 11, SE-263 62 VIKEN (SE).

(74) Agent: **KABBENÄS, Karolin**; Välinge Innovation AB, Prästavägen 513, SE-263 64 VIKEN (SE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

**Published:**
— *with international search report (Art. 21(3))*

WO 2022/010408 A1

(54) Title: GLOSSY PRINTING

(57) Abstract: A method for modifying the degree of gloss of a surface. The method including the steps of a) providing an object; b) applying to at least one surface of the object, a powder 5 composition comprising a thermosetting binder; c) applying onto the at least one surface of the resulting object in b), a fluid composition; and d) applying heat and pressure to the resulting surface from c) with a press plate in a pressing device.

# GLOSSY PRINTING

## TECHNICAL FIELD

The present application relates to methods of altering or modifying the gloss of a surface. Products or objects obtainable by the methods of the application are also described herein. These products or objects may comprise at least one surface which further comprises a pressed power or an overlay paper wherein a fluid composition is encapsulated.

## BACKGROUND ART

In the art various methods have been presented which relate to the application of a glossy surface layer on a substrate. One example is seen in US 2008/266371, which relates to a system and associated methods for printing matte and glossy images on a glossy media substrate comprising an ink set that comprises at least one pigmented ink-jet ink including an anionic surface charged pigment dispersed in a first liquid vehicle and a substantially colourless matting liquid with at least one matting agent dispersed or solvated in a second liquid vehicle. Additionally, when the pigmented ink-jet ink is printed on the glossy media substrate alone, the pigmented ink-jet ink has a glossy appearance, and wherein when the colourless matting liquid is overprinted or underprinted with respect to the pigmented ink-jet ink on the glossy media substrate, the pigmented ink-jet ink combined with the matting liquid exhibits a visually perceptible matte appearance compared to the glossy appearance of the ink-jet ink printed alone.

Furthermore, it is known in the art to employ UV-varnish or XYMER-technology to alter the degree of gloss of a surface.

## SUMMARY OF THE INVENTION

An aspect of the present application relates to modifying the glossy appearance of a surface and specifically methods for altering or modifying the degree of gloss of a surface. In more detail, the invention relates to a method for modifying the degree of gloss of a surface, the method comprising the steps of;

a) providing an object;

b) applying a powder composition comprising a thermosetting binder to at least one surface of the object;

c) applying onto the powder composition on the at least one surface of the object a fluid composition;

d) applying heat and pressure to the at least one surface resulting from c) with a press plate in a pressing device.

Any of the methods described herein may be employed or adapted into existing productions lines already in use in any type of industry, or alternatively, the methods described herein may be used in any specially designed machinery.

In another aspect, the present application relates to modifying the glossy appearance of a surface and methods in relation thereto, wherein the method comprises the steps of;

i) providing a sheet comprising a melamine resin;

ii) applying a fluid composition onto the sheet in i);

iii) applying the resulting sheet in ii) onto a surface of an object;

iv) optionally heating the resulting surface of the object by suitable means;

v) applying heat and pressure to the resulting surface of the object in iii) or iv) with a pressing device.

In another aspect, present application relates to an object obtainable by any of the methods described herein.

In yet a further aspect, the present application relates to an object comprising at least one surface, which further comprises a pressed powder wherein a fluid composition may be encapsulated. The area comprising the encapsulated fluid provides for a matt or lusterless appearance to the surface.

## DETAILED DESCRIPTION OF THE INVENTION

Methods described herein relate to modifying the glossy appearance of a surface and specifically to altering or modifying the degree of gloss of the surface. In more detail, the methods for modifying the degree of gloss of a surface may comprise the steps of:

a) providing an object;

b) applying a powder composition comprising a thermosetting binder to at least one surface of the object;

c) applying onto the powder composition on the at least one surface of the object a fluid composition;

d) applying heat and pressure to the resulting surface from c) with a press plate in a pressing device.

Any of the methods described herein may be employed or adapted into existing productions lines already in use in any type of industry, or alternatively, the methods may be used in any specially designed machinery.

Apart from the above mentioned advantage, the methods described herein provide a more effective process for producing a surface with varying degrees of gloss such that the surface comprises several different degrees of gloss.

The methods also provide a simplified procedure requiring minimal modification to existing production machinery and/or a possible addition to a simple machine or production unit into a production line. The methods also provide a shorter procedure in producing glossy surfaces or partially glossy surfaces. This may include preparing the surfaces in fewer method steps when compared to the processes taught in the art.

One advantage that the methods offer is a higher degree of flexibility by allowing control of the degree of glossiness with a print without the need of creating specific templates to achieve various degrees of gloss on the surface of an object.

Thus, the methods can also provide surfaces comprising glossiness of varying degrees, wherein the resulting surfaces have high durability and resistance against wear and tear.

The methods disclosed herein may be part of a larger series of production methods or steps or may be a single production method. In any of the methods described herein, the method may comprise a pressing step. The pressing itself may be conducted by any conventional method in the art such as, e.g., a pressing plate. The pressing plate may be part of a pressing device of any kind. The pressing device may be static or may be a continuous press. Thus, the methods described herein may be part of a continuous production or preparation step. The methods may also be part of a static production or preparation process.

The object employed in the methods herein may in principle be any type of object commonly used in the art. In one embodiment, the object comprises a surface which is to be manipulated by the methods described herein. The object may made from a material commonly used in the art such as wood, paper or cellulose, fiber, cement, or any type of polymer. The object may also comprise many types of different materials and may consequently comprise any combination of materials such as, e.g., a combination of at least two of the following: wood, paper, concrete like materials, or any type of polymer. The object may be a MDF, HDF, particle board, plywood or lamella core.

In one embodiment, the object comprises a solid wood-based material, such as a wood veneer or a wood panel of any desirable thickness.

In another embodiment, the object comprises a paper sheet or other cellulose material, such as cotton-based material, hemp-based material or bagasse-based material. The object may be in the shape of a solid sheet or a powder composition.

In one embodiment, the object is a floorboard or tile.

In another embodiment, the object comprises a material based on magnesium oxide such as, e.g., magnesium oxide boards (MGO boards).

The structure of the surface of the object prior to undergoing the methods described herein may be completely plane without any porous structure or may be coarse or rough with a

potentially also with a porous structure, or the surface may be in any degree from completely plane without any porous structure to coarse or rough with potentially a porous structure.

In one embodiment, the surface of the object prior to undergoing the methods described herein is essentially plane without any porous structure on the surface. In other embodiments the surface of the object prior to undergoing the methods described herein comprises a microstructure which results in the surface being shiny or reflective or even mirror like in appearance.

After the object has undergone the methods described herein, the surface of the object is at least partially made mat or lusterless in comparison to areas of the object which are not treated by the methods. Consequently, the fluid composition may thus be applied to selected parts of the surface of the object. The selected parts of the surface of the object will be made mat or lusterless once subjected to the methods described herein.

*Gloss measurements*

As is known in the art, gloss is an important embodiment of our visual perception of objects. The perception of gloss can relate to a product's finish, texture and how a sample is illuminated and viewed. Surfaces with high reflectance are perceived as glossy, shiny or lustrous, whilst less reflective surfaces are perceived as semi-gloss, lusterless or matt. Gloss can be measured by several different techniques known in the art. One example is by using an optical instrument (gloss meter). Gloss is measured by directing a constant intensity light beam, at a fixed angle, on to the test surface and then monitoring the amount of reflected light from the same angle. This specular reflectance is measured using a gloss meter. A glossmeter provides quantifiable gloss measurements, expressed as gloss units (GU).

Surfaces with a brilliant or highly polished finish reflect images clearly. This distinct reflection is caused by the incident light reflecting on the surface in a specular direction. In contrast, semi and matt surfaces reflect images less distinctly and with reduced intensity. On semi or matt surfaces light not only reflects in a specular direction but also is scattered causing the reflected image to appear diffused.

Gloss measurement is based on the amount of light reflected on the surface relative to a polished glass reference standard, measured in Gloss Units (GU). The amount of light that is reflected on the surface is dependent on the angle of incidence and the properties of the surface.

Gloss is categorised as either matt, semi or high gloss. In order to determine the most appropriate measurement angle a measurement is usually started with a glossmeter set at a 60° angle of incidence. If the result is between 10 - 70GU, the coating is termed 'semi-gloss' and should be measured using the 60° angle on the glossmeter. If the result is less than 10GU, the product is 'low gloss' and should be measured using the 85° angle on the

glossmeter and if it is greater than 70GU, the product is known as 'high gloss' and should be measured using the 20° angle on the glossmeter. All three angles should be recorded (20, 60 & 85°) when measuring gloss on anodised metals to ensure a complete understanding of the specular reflectance between the coating and the metal substrate. A list is shown below illustrating the various criteria for gloss ranges.

| **Gloss Range** | **60° value** | **Measure with** |
|---|---|---|
| High Gloss | > 70GU | 20° |
| Semi Gloss | 10 - 70GU | 60° |
| Low/ Matt | < 10GU | 85° |

*Reflectance*

Whilst the Gloss Unit (GU) scale is linear, each angle of incidence has a different measurement range; 0 – 2000GU (20°), 0 – 1000GU (60°), 0 – 160GU (85°).

Reflectance compares the amount of light energy transmitted and received by a gloss meter and expresses the value as a percentage of the angle of incident's full measurement range and the value is displayed as a percentage relative to the selected angle of incidence. As the measurement range for a 20° gloss meter is 0 -2000GU; a value of 1000GU at 20° would be expressed as 50%20, and a value of 500GU would be expressed as 25%20. A value of 500GU at 60° but would be expressed as 50%60 as the measurement range for the 60° is 0 – 1000GU. The shinier a surface is, the closer the value will be to 100%. Materials with a high refractive index, such as clear plastics or varnishes, can have measurement values above 100GU. Highly reflective metals can have gloss values up to 2000GU. Furthermore, the measurement value may be increased for transparent materials due to multiple reflections in the bulk of the material. In all these cases, it is common to express the measurement results in % Reflectance.

*Haze*

Haze causes a drop in reflected contrast and causes 'halos' to appear around the reflected light sources, dramatically reducing the visual quality. In accordance with ASTM D4039, Haze may be defined as the numeric difference between the specular reflectance at 60° and 20°. This is expressed in Haze Units (HU).

As is apparent from the objectives of the application, the methods and products described herein accomplish a visible difference in gloss on a treated surface of an object. The difference in gloss may be measured by any of the techniques described herein and techniques known in the art.

Depending on how the fluid composition is applied, various well defined patterns may be obtained such that the parts of the surface of the object, onto which the fluid composition has been applied, contain a lower degree of gloss and will appear as semi-mat or mat after having been subjected to the methods described herein.

The powder composition may be applied to at least a part of the surface of the object. The powder composition may be applied onto the surface by technologies known in the art.

In one embodiment, the powder composition may comprise a thermosetting binder. The thermosetting binder may be any suitable thermosetting agent and/or amino resin, such as melamine formaldehyde resin or urea formaldehyde resin. Another example may be phenol formaldehyde resin.

In another embodiment, the binder may be a thermoplastic powder, such as a co-polymer of vinyl acetate-ethylene (VAE), for example Vinnapas®.

The powder composition may comprise various other components known in the art such as one or more fibre components, resins, or pigments. The powder composition may also comprise one or more fillers such as barium sulphate, various types of kaolin clay, talcum and/or chalk. In an embodiment the powder composition may comprise fibre components at an amount of at least 25wt%. The amount of resin may be between 25-75wt.%, preferably about 45-60wt%, more preferably about 52.5wt.%. The amount of pigment depends on which colour and may vary between 0.1-10wt.%. Further, the amount of filler in the powder composition may be between 0-10wt.%. Preferred is that the total amount of pigment and filler, combined, is below 10wt.%. This is advantageous since the risk of unwanted effects such as chalking, flooding and blooming may be reduced.

In an alternative embodiment, the powder composition may comprise one or more of fibre components, such as cellulose fibres, resin, such as thermosetting binders (e.g., melamine-formaldehyde resin), colour pigments and/or metal oxides such as, e.g., $Al_2O_3$. In an embodiment the powder composition comprises fibre components at an amount of at least 25wt%. The amount of resin may be between 25-75wt.%, preferably about 45-60wt%, more preferably about 52.5wt.%. The amount of pigment depends on which colour and may vary between 0.1-10wt.%. The amount of metal oxides may be between 2.5-15wt.%, more preferably 5-10wt.%.

In yet another embodiment, the powder composition may comprise one or more of fibre components, such as cellulose fibres, resin, such as thermosetting binders (e.g., melamine-formaldehyde resin), colour pigments, fillers and/or metal oxides, such as, e.g., $Al_2O_3$. In an embodiment the powder composition may comprise fibre components at an amount of at least 25wt%. The amount of resin may be between 25-75wt.%, preferably about 45-60wt%, more preferably about 52.5wt.%. The amount of pigment depends on which colour and may vary between 0.1-10wt.%. Further, the amount of filler in the powder composition may

be between 0-10wt.%. Preferred is that the total amount of pigment and filler, combined, is below 10wt.%. This is advantageous since the risk of unwanted effects such as chalking, flooding and blooming may be reduced. The amount of metal oxides may be between 2.5-15wt.%, more preferably 5-10wt.%. The methods described herein may also comprise applying onto the at least one surface of the object a fluid composition. The amount of fluid composition applied may be between 5-25ml/$m^2$, more preferably 9-14 ml/$m^2$. The fluid composition may be applied to the surface of the object, after a powder composition has been applied to the surface of the object. The fluid composition may be applied by any conventional method such as printing, digital printing, spraying or spraying through a template.

The fluid composition may comprise any monoethylene based fluid or ink based fluid composition, which may be a water based ink composition. The fluid composition may be clear/transparent or may have any degree of opaqueness. The fluid composition may be uncoloured or may have any desired colour.

The fluid composition may have a boiling temperature above the intended pressing temperature. For example, the boiling temperature may be at least 3°C above the pressing temperature, at least 5°C above, at least 10°C above, or at least 20°C above, and for example in a range of 3° to 50°C above. For example, the fluid composition may have a boiling temperature of about 120°C to about 250°C, about 160°C to about 200°C, about 170°C to about 210°C, or at a temperature of about 160°C, about 180°C, or about 200°C. For example the fluid composition may have a boiling temperature of about 187°C to about 207°C, preferably about 197°C. For example the fluid composition may have a boiling temperature of about 178°C to about 198°C, preferably 188°C. This is advantageous as the fluid composition will be encapsulated in the powder without evaporating during pressing since the boiling temperature is higher than the pressing temperature. The result is that the encapsulated fluid will give a different appearance, i.e. lowering the gloss.

The fluid composition may be applied to at least a part of the surface of the object. The fluid composition may be applied by various technologies such as spraying, printing or applying the fluid in any suitable manner, e.g., spraying through a scaffold or pattern grid or template. The fluid composition may be applied such that the surface comprises well defined areas or patterns of the fluid composition on the object. Consequently, the object may thus have surface areas comprising the applied fluid composition while other areas of the surface are free of the fluid composition. The fluid composition may thus be applied to form well defined patterns of any kind on the surface of the object. In another embodiment, the fluid composition may be applied to the entire surface of the object.

The methods may also comprise a pressing step. The pressing step may succeed the method step wherein the powder and fluid composition has been applied to the surface of the object. Consequently, the pressing step may be exemplified by a step d), wherein the resulting

treated object wherein the surface of the object has been powder treated and subsequently, the fluid composition has been applied, is subjected to a pressing step. The pressing step may employ any type of suitable pressing device known in prior art. The pressing itself may be conducted using a pressing plate of any kind or suitable dimension.

The pressing step may be part of a continuous process, such as a continuous press device or a static press device.

The pressing step may be conducted at any suitable temperature. Thus, the pressing plate may be applied to the surface of the object at temperatures ranging from about 90°C to about 300°C, such as about 100°C to about 290°C, such as about 110°C to about 280°C, such as about 120°C to about 250°C, or such as about 160°C to about 200°C.

In one embodiment, the temperature by which the object is heated may be any temperature in range of about 120°C to about 250°C.

In another embodiment, the temperature by which the object is heated may be any temperature in range of about 160°C to about 200°C.

In another embodiment, the temperature by which the object is heated may be any temperature in range of about 170°C to about 210°C.

In another embodiment, the temperature by which the object is heated may be a temperature of about 160°C, or about 180°C, or about 200°C.

In one embodiment, the pressing temperature is below the boiling point of the fluid composition or just at the boiling point of the fluid composition.

The pressing step may be conducted by employing an elevated pressure, such that the pressing plate exerts a pressure on the surface of the object. The applied pressure may be any pressure in range of about 5 bar to about 150 bar, such as about 10 bar to about 100 bar, such as about 10 bar to about 90 bar, or such as about 30 bar to about 60 bar.

In one embodiment, the applied pressure is about 10 bar to about 90 bar.

In another embodiment, the applied pressure is about 30 bar to about 60 bar.

In another embodiment, the applied pressure is about 30 bar to about 50 bar.

In another embodiment, the applied pressure is about 40 bar to about 50 bar.

The pressing step may have any suitable duration of time. Consequently, the pressing may have a duration of time in the interval about 1 second to about 300 second, such as about 1 second to about 240 seconds, such as about 1 second to about 180 seconds, such as about 1 second to about 120 seconds, or such as about 10 seconds to about 60 seconds.

In one embodiment, the duration of the pressing is from about 1 second to about 120 seconds.

In another embodiment, the duration of the pressing is about 10 seconds to about 60 seconds.

In one embodiment, the duration of the pressing is about 8 seconds to about 120 seconds.

In one embodiment, the duration of the pressing is about 25 seconds to about 30 seconds.

It is to be understood that during the duration of the pressing step both pressure and heat is applied simultaneously. This causes a thermosetting of the components in the powder composition and further results in a hardening of the powder, thereby adhering the powder composition to the surface of the object.

After pressing, the surface of the object may have selected areas with a lower degree of gloss and areas of the surface with a higher degree of gloss.

A further aspect of the application relates to methods for modifying the degree of gloss of a surface. These methods may comprise the steps of;

i) providing a sheet or a carrier impregnated with a thermosetting binder, such as an overlay paper impregnated with a thermosetting binder;

ii) applying a fluid composition onto the sheet or carrier;

iii) applying the resulting sheet in ii) onto a surface of an object;

iv) optionally heating the resulting surface in step iii) of the object by suitable means;

v) applying heat and pressure to the resulting surface of the object in iii) or iv) with a pressing device.

The sheet may be of any suitable thickness and may be of any suitable material such as a cellulose based material like paper or thin sheets of wood, e.g., a wood veneer. The sheet may also be based on any suitable polymer.

The pressing step may be conducted at a temperature in range of about 90°C to about 300°C, such as about 100°C to about 290°C, such as about 110°C to about 280°C, such as about 120°C to about 250°C, such as about 160°C to about 200°C.

In one embodiment, the temperature at which the object is heated may be any temperature in range of about 120°C to about 250°C.

In another embodiment, the temperature at which the object is heated may be any temperature in range of about 160°C to about 200°C.

In another embodiment, the temperature at which the object is heated may be any temperature in range of about 170°C to about 210°C.

In another embodiment, the temperature at which the object is heated may be a temperature of about 160°C, or about 180°C, or about 200°C.

In one embodiment, the pressing temperature at which the object is heated is below the boiling point of the fluid composition or just at the boiling point of the fluid composition.

The pressing step may be conducted by employing an elevated pressure, such that the pressing plate exerts a pressure on the surface of the object. The applied pressure may be

any pressure in range of about 5 bar to about 150 bar, such as about 10 bar to about 100 bar, about 10 bar to about 90 bar, or about 30 bar to about 60 bar.

In one embodiment, the applied pressure is about 10 bar to about 90 bar.

In another embodiment, the applied pressure is about 30 bar to about 60 bar.

In another embodiment, the applied pressure is about 30 bar to about 50 bar.

In another embodiment, the applied pressure is about 40 bar to about 50 bar.

The pressing step may have any suitable duration of time. Consequently, the pressing may have a duration of time in the interval of about 1 second to about 300 second, such as about 1 second to about 240 seconds, about 1 second to about 180 seconds, about 1 second to about 120 seconds, or about 10 seconds to about 60 seconds.

In one embodiment, the duration of the pressing is about 1 second to about 120 seconds.

In another embodiment, the duration of the pressing is about 10 seconds to about 60 seconds.

In one embodiment, the duration of the pressing is about 8 seconds to about 120 seconds.

In one embodiment, the duration of the pressing is about 25 seconds to about 30 seconds.

The fluid composition applied to the sheet or carrier may be a fluid composition as described herein. The fluid composition may be applied by any conventional method such as printing or spraying onto the sheet.

The fluid composition may comprise any monoethylene based fluid or ink-based fluid composition, which may be a water-based ink composition. The fluid composition may be clear/transparent or may have any degree of opaqueness. The fluid composition may be uncoloured or may have any desired colour.

The fluid composition may have a boiling temperature above the intended pressing temperature. For example, the boiling temperature may be at least 3°C above the pressing temperature, at least 5°C above, at least 10°C above, or at least 20°C above, and for example in a range of 3° to 50°C above. For example, the fluid composition may have a boiling temperature of about 120°C to about 250°C, about 160°C to about 200°C, about 170°C to about 210°C, or at a temperature of about 160°C, about 180°C, or about 200°C. This is advantageous as the fluid composition will be encapsulated in the impregnated sheet without evaporating during pressing since the boiling temperature is higher than the pressing temperature. The result is that the encapsulated fluid will give a different appearance, i.e. lowering the gloss.

The fluid composition may be applied to at least a part of the sheet in order to create any desirable pattern or surface design. The fluid composition may be applied such that the

surface of the sheet comprises well defined areas or patterns of the fluid composition. Consequently, the object may thus have surface areas comprising the applied fluid composition while other areas of the surface are free of the fluid composition. For example, 20-80%, such as 35-65%, of the surface area may be free of the fluid compositions. This makes it possible to create any type of surface design with the feature of gloss. Thus, the application of the fluid composition depends on the surface design to be made. After applying pressure and/or heat the surface areas where the fluid composition is present will have a different glossiness than the surface areas where the fluid composition is missing.

In another embodiment, the fluid composition may be applied to the entire surface of the sheet. This is advantageous if it is desirable to reduce the glossiness of the entire surface area.

The methods described herein may also comprise applying the sheet onto the surface of an object. Suitably, the sheet is applied to the surface of an object after the fluid composition has been applied to the sheet. The sheet may be applied onto the surface of the object by any suitable industrial means.

The heating may be performed by any suitable means such as IR irradiation or applying a heated jet air stream.

The methods described herein may also comprise pressing the resulting surface of the object, i.e. after the sheet has been applied onto the surface of an object and subsequently been subjected to an optional heating step. The pressing step may be conducted by employing a press plate in any suitable device known in the art, such as a press belt.

After pressing, the surface of the object may comprises select areas with a lower degree of gloss and areas of the surface with a higher degree of gloss.

The present application also relates to an object obtainable by the methods as described herein.

The object may be any desirable object wherein at least part of the surface is to be matt, semi-mat or otherwise have a lusterless pattern.

The object may have an essentially plane surface, such as, e.g., a floor board or a tile. The object may also be such that at least part of the object is essentially plane.

The object may comprise at least one surface which further comprises a pressed power wherein a fluid composition is encapsulated and wherein the area comprising the encapsulated fluid gives a matt or lusterless appearance to the surface.

Overall, the surface of the object after being treated by any of the methods described herein will comprise a matt, semi-matt, or lusterless appearance on the parts of the surface onto which the fluid composition was applied.

## EXAMPLES

The following example is provided to better illustrate the methods and objects described herein. The example is not to be interpreted as limiting the scope of the application. To the extent that specific materials are mentioned, it is merely for purposes of illustration and not intended to limit the application. One skilled in the art may develop equivalent means or reactants without the exercise of inventive capacity and without departing from the scope of the application. It will be understood that many variations can be made in the procedures described herein while still remaining within the bounds of the present application. It is the intention of the inventors that such variations be included within the scope of the application.

*Example 0 – only powder*

In the two below reference examples a surface with only a powder composition, including 53.4 wt.% melamine formaldehyde resin, 31.5 wt.% recycled wood fibres from HDF, where the fibres are grinded and sieved to 0-300 μm size, 9.4 wt.% aluminum oxide and 5.7 wt.% pigments, was pressed with a high gloss press plate, example 0a, and with a high gloss casting paper, example 0b. The amount of powder composition applied to the surface was 400g/m$^2$. The gloss of the resulting surfaces was measured with a ZEHNTNER testing instrument, ZGM 1110. The tables below present the gloss measurements.

Example 0a – pressed with a high gloss press plate

To a piece of a wood-based board, a HDF, a powder composition, as previously disclosed, was applied. Heat and pressure were applied by a high gloss press plate to the surface with the following parameters: pressure 40 bar; pressing time 30 sec.; and pressing temperature 180°C. The gloss of the resulting surface was then measured, and the results can be seen in Table 1.

Table 1 - Example 0a

| Example 0a – only powder | 20° | 60° | 85° |
|---|---|---|---|
| Gloss (GU) | 16.0 | 55.1 | 65.4 |

Example 0b – pressed with a high gloss casting paper

To a piece of a wood-based board, a HDF, a powder composition, as previously disclosed, was applied. A high gloss casting paper was applied to the surface before applying heat and pressure. Heat and pressure were applied by a press plate to the high gloss casting paper and the surface with the following parameters: pressure 40 bar; pressing time 30 sec.;

and pressing temperature 180°C . The gloss of the resulting surface was then measured, and the results can be seen in Table 2.

Table 2 - Example 0b

| Example 0b – only powder | 20° | 60° | 85° |
|---|---|---|---|
| Gloss (GU) | 8.2 | 44.0 | 48.2 |

*Example 1 – powder composition with a fluid composition pressed with a high gloss press plate*

In the three examples below, a surface with a powder composition, as disclosed in Example 0, and a fluid composition, wherein the fluid composition was Mexar Model Fluid purchased from Mexar the fluid (according to the safety data sheet) comprises >= 50 wt.% ethylene glycol, distributed in three different ways are disclosed. The amount of fluid composition applied to the powder composition was 5 g/m$^2$. The surfaces were pressed with both a high gloss press plate, and with a high gloss casting paper. The gloss of the resulting surfaces was measured with a ZEHNTNER testing instrument, ZGM 1110. The tables below present the gloss measurements and the comparison to the relevant reference example.

Example 1a – digital printing

To a piece of a wood-based board, a HDF, a powder composition, as previously disclosed, was applied. To the resulting surface, a fluid composition was applied in form of an ink composition. In this first example the ink composition was applied to the surface by digital printing. In a first comparison, heat and pressure was applied to the surface by a high gloss press plate to create the resulting surface. In a second comparison, a high gloss casting paper was applied between the surface and the press plate before heat and pressure was applied to the surface by a standard press device, to create the resulting surface. The parameters for the heating and pressing process were: the top press plate had a temperature of 180°C and the bottom press plate had a temperature of 180°C, a pressure of 40 bar was applied during 30 seconds.

Table 3 - Example 1a

| Example 1a – digital printing | 20° | 60° | 85° |
|---|---|---|---|
| Gloss (GU) | 11.3 | 44.9 | 56.2 |
| Difference comp. to Example 0a | -4.7 | -10.2 | -9.2 |
| | | | |
| Gloss (GU) | 4.1 | 29.8 | 37.9 |

| | | | |
|---|---|---|---|
| Difference comp. to Example 0b | -4.1 | -14.2 | -10.3 |

As can be seen by the results in the table, compared to the example 0a, the gloss was reduced in the surface areas where the ink composition was present. A reduction of at least 4% is a surprising amount of reduction. The digital printing allows to create a detailed and sharp surface design with, e.g., fine lines, which is preferred for, e.g., creating letters or numbers in the surface.

Example 1b – analogue printing

To a piece of a wood-based board, a HDF, a powder composition, as previously disclosed, was applied. To the resulting surface, a fluid composition was applied in form of an ink composition. In this second example the ink composition was applied to the surface by spraying the ink composition through a pattern template. In a first comparison, heat and pressure was applied to the surface by a high gloss press plate to create the resulting surface. In a second comparison, a high gloss casting paper was applied between the surface and the press plate before heat and pressure was applied to the surface by a standard press device, to create the resulting surface. The parameters for the heating and pressing process were: the top press plate had a temperature of 185°C and the bottom press plate had a temperature of 180°C, a pressure of 40 bar was applied during 30 seconds.

Table 4 - Example 1b

| Example 1b – analogue printing | 20° | 60° | 85° |
|---|---|---|---|
| Gloss (GU) | 10.8 | 44.4 | 55.4 |
| Difference comp. to Example 0a | -5.2 | -10.7 | -10.0 |
| | | | |
| Gloss (GU) | 4.4 | 30.1 | 38.4 |
| Difference comp. to Example 0b | -3.8 | -13.9 | -9.8 |

As can be seen by the result in the table, compared to the example 0a, the gloss was reduced in the surface areas where the ink composition was present. A reduction of at least 3.8% is a surprising amount of reduction. The analogue printing allows to create a surface design with more basic structures and designs compared to the digital printing.

Example 1c – rotational spray nozzle

To a piece of a wood-based board, a HDF, a powder composition, as previously disclosed, was applied. To the resulting surface, a fluid composition was applied in form of an

ink composition. In this first example the ink composition was applied to the surface by employing a high rotational spray nozzle. In a first comparison, heat and pressure was applied to the surface by a high gloss press plate to create the resulting surface. In a second comparison, a high gloss casting paper was applied between the surface and the press plate before heat and pressure was applied to the surface by a standard press device, to create the resulting surface. The parameters for the heating and pressing process were: the top press plate had a temperature of 185°C and the bottom press plate had a temperature of 180°C, a pressure of 40 bar was applied during 30 seconds.

Table 5 - Example 1c

| Example 1c – rotational spray nozzle | 20° | 60° | 85° |
|---|---|---|---|
| Gloss (GU) | 11.0 | 44.2 | 55.4 |
| Difference comp. to Example 0a | -5.0 | -10.9 | -10.0 |
| | | | |
| Gloss (GU) | 4.2 | 29.9 | 37.7 |
| Difference comp. to Example 0b | -4.0 | -14.1 | -10.5 |

As can be seen by the result in the table, compared to the example 0a, the gloss was reduced in the surface areas where the ink composition was present. A reduction of at least 4% is a surprising amount of reduction. The rotational spray nozzle distributes the ink composition homogenously over the surface area creating a resulting surface design where the gloss of the whole surface area is reduced.

*Example 2 – impregnated overlay paper with a fluid composition*

In a further example, an ink composition, wherein the ink composition was Mexar Model Fluid purchased from Mexar the fluid (according to the safety data sheet) comprises >= 50 wt.% ethylene glycol, was applied onto an impregnated overlay paper by digital printing. The amount of applied fluid composition was 5g/m$^2$. The impregnated overlay paper had a base paper weight of 25g/m$^2$ and was impregnated with Melamine formaldehyde resin such that the impregnated paper weight was 100g/m$^2$. The overlay paper was exposed to IR radiation in order to dry the applied ink composition. The resulting printed overlay paper was subsequently pressed onto a floor board, a HDF, by pressing the surface in a standard press device wherein top press plate had a temperature of 185°C, bottom press plate a temperature of 180°C, at 40 bar pressure for a duration of 30 seconds. The gloss of the resulting surfaces

was measured with a ZEHNTNER testing instrument, ZGM 1110. The table below presents the gloss measurements.

Table 6 - Example 2

| Example 2 – overlay paper | 20° | 60° | 85° |
|---|---|---|---|
| Gloss (GU) | 12.9 | 48.9 | 59.1 |

As can be seen from the above, the methods disclosed herein produce surfaces wherein, where the fluid composition has been applied, a matt or lusterless surface is formed.

## CLAIMS

1. A method for modifying the degree of gloss of a surface, the method comprising the steps of;

a) providing an object;

b) applying a powder composition comprising a thermosetting binder to at least one surface of the object;

c) applying onto the powder composition on the at least one surface of the object a fluid composition;

d) applying heat and pressure to the resulting surface from c) with a press plate in a pressing device.

2. The method according to claim 1, wherein the pressing device is a continuous pressing device or a static pressing device.

3. The method according to claim 1, wherein the pressing step takes place under a temperature of about 120°C to about 250°C.

4. The method according to claim 1, wherein the pressing step employs a pressure of about 10 bar to about 90 bar.

5. The method according to claim 1, wherein the pressing step has a duration of about 1 second to about 120 second.

6. The method according to claim 1, wherein the fluid composition is a monoethylene based fluid or a water based ink composition.

7. The method according to claim 1, wherein the fluid composition is transparent.

8. The method according to claim 1, wherein the fluid composition has a colour.

9. The method according to claim 1, wherein the thermosetting binder of the powder composition is an amino resin.

10. The method according to claim 1, wherein the thermosetting binder of the powder composition is a melamine formaldehyde resin, a urea formaldehyde resin, or a phenol formaldehyde resin.

11. The method according to claim 1, wherein the powder composition comprises one or more of various fibre components, resins, pigments, binders, and fillers such as barium sulphate, various types of kaolin clay, talcum or chalk.

12. The method according to claim 1, wherein the fluid composition is applied by printing, digital printing, spraying or spraying through a template.

13. The method according to claim 1, wherein the powder composition comprises one or more of cellulose fibres, a melamine-formaldehyde resin, colour pigments, and/or metal oxides such as, e.g., $Al_2O_3$.

14. The method according to claim 1, wherein the powder composition is applied onto the at least one surface of the object by scattering, printing or spraying.

15. A method for modifying the degree of gloss of a surface, the method comprising the steps of:

i) providing a sheet or a carrier impregnated with a thermosetting binder;

ii) applying a fluid composition onto the sheet or carrier;

iii) applying the resulting sheet in ii) onto a surface of an object;

iv) optionally heating the resulting surface of the object in step iii);

v) Applying heat and pressure to the resulting surface of the object in iii) or iv) with a pressing device.

16. The method according to claim 15, wherein the sheet is a paper or cellulose based sheet, a sheet based on a polymeric material or any combinations thereof.

17. The method according to claim 15, wherein the pressing device is a continuous pressing device or a static pressing device.

18. The method according to claim 15, wherein the pressing step takes place under a temperature of about 120°C to about 250°C.

19. The method according to claim 15, wherein the pressing step employs a pressure of about 10 bar to about 90 bar.

20. The method according claim 15, wherein the pressing step has a duration of about 1 second to about 120 second.

21. The method according to claims 15, wherein the fluid composition is a monoethylene based fluid or a water based ink composition.

22. The method according to claim 15, wherein the fluid composition is applied by printing, digital printing, spraying, or spraying thorough a template.

23. The method according to claim 15, wherein the optional heating step is performed by employing IR radiation or blowing with a heated air stream.

24. The method of claim 15, wherein the method comprises creating a matt or lusterless surface on an area of the surface to which the fluid composition has been applied, wherein areas on which no fluid composition has been applied appear glossy.

25. The method of claim 15, wherein the surface of the press plate is completely unstructured or contains various degrees of structure.

26. An object obtainable by the method according to claim 15.

27. The object according to claim 26, wherein the object comprises an essentially plane surface.

28. An object comprising at least one surface which further comprises a pressed powder wherein a fluid composition is encapsulated and wherein the area comprising the encapsulated fluid gives a matt or lusterless appearance to the surface.

29. The object according to claim 28, wherein the object comprises an essentially plane surface.

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/SE2021/050691

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B05D, B32B, B44C, E04C, E04F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 20110250404 A1 (PERVAN DARKO ET AL), 13 October 2011 (2011-10-13); paragraphs [0026], [0036]-[0037], [0078]-[0086], [0237]; claim 32 | 1-14, 28-29 |
| | -- | |
| X | WO 2011129757 A1 (CERALOC INNOVATION BELGIUM ET AL), 20 October 2011 (2011-10-20); page 10, line 27 - page 12, line 17; page 10, line 1 - line 12; claim 32 | 1-14, 28-29 |
| | -- | |
| X | US 20140220318 A1 (PERVAN DARKO), 7 August 2014 (2014-08-07); paragraphs [0100]-[0101] | 1-14 |
| | -- | |

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 12-10-2021 | 13-10-2021 |

| Name and mailing address of the ISA/SE | Authorized officer |
|---|---|
| Patent- och registreringsverket<br>Box 5055<br>S-102 42 STOCKHOLM<br>Facsimile No. + 46 8 666 02 86 | Erik Johansson<br>Telephone No. + 46 8 782 28 00 |

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/SE2021/050691

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1: Claims 1-14 and 28-29 directed to a method for modifying the degree of gloss by applying a powder composition comprising thermosetting binder to a surface followed by applying a fluid composition onto the surface and then applying heat and pressure.
2: Claims 15-27 directed to a method for modifying the degree of gloss of a surface by providing a sheet or carrier impregnated with a thermosetting binder, applying a fluid composition onto the sheet or carrier and thereafter applying the resulting sheet onto the surface. Finally, heat and pressure are applied to the surface.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-14 and 28-29

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/SE2021/050691

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | US 4530856 A (KAUFFMAN WILLIAM J ET AL), 23 July 1985 (1985-07-23); abstract; all claims<br>-- | 1-14, 28-29 |
| A | US 4689259 A (MILLER JR JESSE D ET AL), 25 August 1987 (1987-08-25); all figures; all claims<br>-- | 1-14, 28-29 |
| D, A | US 20080266371 A1 (MA ZEYING ET AL), 30 October 2008 (2008-10-30); whole document<br>--<br>-------- | 1-14, 28-29 |

International application No.
PCT/SE2021/050691

**Continuation of:** second sheet

**International Patent Classification (IPC)**

***B05D 5/02*** (2006.01)
***B05D 1/36*** (2006.01)
***B32B 37/24*** (2006.01)
***B32B 38/14*** (2006.01)
***B44C 5/04*** (2006.01)
***E04C 2/24*** (2006.01)
***E04F 15/02*** (2006.01)
*B32B 21/00* (2006.01)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| US | 20110250404 | A1 | 13/10/2011 | US | 10899166 | B2 | 26/01/2021 |
| WO | 2011129757 | A1 | 20/10/2011 | CN | 106042755 | A | 26/10/2016 |
| | | | | CN | 102917888 | A | 06/02/2013 |
| | | | | EP | 2839957 | B1 | 13/03/2019 |
| | | | | EP | 2558306 | A4 | 25/02/2015 |
| | | | | ES | 2725623 | T3 | 25/09/2019 |
| | | | | HR | P20190609 | T1 | 31/05/2019 |
| | | | | TR | 201905979 | T4 | 21/05/2019 |
| US | 20140220318 | A1 | 07/08/2014 | EP | 3418069 | A1 | 26/12/2018 |
| | | | | EP | 2951033 | B1 | 15/08/2018 |
| | | | | HR | P20181592 | T1 | 30/11/2018 |
| | | | | US | 20210214898 | A1 | 15/07/2021 |
| | | | | US | 10988901 | B2 | 27/04/2021 |
| | | | | US | 20180320321 | A1 | 08/11/2018 |
| | | | | US | 10041212 | B2 | 07/08/2018 |
| | | | | WO | 2014120079 | A1 | 07/08/2014 |
| US | 4530856 | A | 23/07/1985 | NONE | | | |
| US | 4689259 | A | 25/08/1987 | NONE | | | |
| US | 20080266371 | A1 | 30/10/2008 | US | 7997714 | B2 | 16/08/2011 |