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Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmas az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

### **Use of a printing paper printed with a pattern for sheetlike components**

The invention relates to the use of a printing paper printed with a decor for planar components. Furthermore, the invention relates to a method for manufacturing decor paper for use in planar components, in particular for floor, wall, ceiling or furniture applications, according to the pre-characterizing clause of Claim 2.

A method of the type mentioned at the beginning and a related printing device are already known from EP 1 749 676 A1. The known method is used to print printing paper digitally, the said paper being used to manufacture planar components, such as lining boards, panels and the like.

EP 1 749 676 A1 deals with providing an inkjet printing method, the printed result on the surface of the objects to be printed being intended to meet the highest quality requirements with regard to the appearance. For this purpose, provision is made for a paper web that is absorbent to liquid synthetic resin along its entire thickness to be impregnated with liquid synthetic resin from one side such that the synthetic resin does not penetrate the paper web completely, so that the other side of the paper web is at least largely free of synthetic resin. The known method is intended to create surfaces which, by means of the choice of the paper and of the ink liquid and possibly a pre-treatment of the surface to be printed, are in each case matched optimally to the known printed result.

However, in connection with the half resin-treated paper web known from EP 1 749 676 A1, it has been established that, depending on the paper material used and the ink used, it is possible, especially at a high ink density and/or a high proportion of water, for the ink coming into contact with the paper web to run in the upper region, resin untreated or only slightly resin treated, and in this way for the so-called blotting paper effect to result. The consequence is a relatively unsatisfactory printed result.

In order to avoid the blotting paper effect, it is otherwise also known to use a printing paper which has an ink-reception layer on its printed side. This is usually a so-called pigment coating. In this regard, reference is made, for example, to DE 199 16 546 C2.

However, both in the case of the printing paper known from EP 1 749 676 A1 and also the printing paper known from DE 199 16 546 C2 it is disadvantageous that these papers are comparatively expensive. Both the partial resin treatment of the underside needed before the printing and the pigment coat on the upper side lead to additional costs, which has a detrimental effect, especially in the case of a mass produced article such as printing paper, for the aforementioned applications, in which large quantities of printing paper are needed.

US 2007/176994 A1 has already disclosed a method for producing wall-coverings, the printing paper being printed by a digital printing device. The printing paper is heated in order to dry the printing ink.

The object of the present invention is to provide a decor paper for planar components which has a high printing quality and can be manufactured simply and economically by an appropriate method.

In order to achieve the aforementioned object, the use of a printing paper as a decor paper for planar components, in particular for floor, wall, ceiling or furniture applications, which printing paper has been printed by means of a digital printing process by a digital printing device and which printing paper has been heated before, during and/or after printing and is resin-untreated and free of an ink-reception layer and is printed with a decor, is provided, wherein the printing paper, after printing, is treated with resin, cut to the desired dimensions and is pressed together with plates to form the planar components.

The invention represents a departure from the prior art, since, despite the additional outlay, it has hitherto been deemed necessary to use the printed paper layer at least partially resin-treated and/or with an ink-reception layer for the applications as decor paper.

In order to achieve the aforementioned object, in a method of the type mentioned at the beginning, the invention provides that, for printing, a resin-untreated printing paper is used, which is free from an ink-reception layer on its printing side, and that the printing paper is heated before, during and/or after printing, and/or the printing ink is heated immediately after being deposited on the printing paper. This method is defined in detail in Claim 2. In the present invention, as opposed to the prior art, a conventional gravure printing paper without coating is used for the digital printing. Hitherto, the starting point was the intrinsically correct assumption that normal printing paper is not suitable for digital printing, since this paper acts like a blotting paper as it is printed. In this case, not only do the inks run during the deposition of the printing ink, it is also such that the paper extracts moisture from the printing ink, which leads to lengthening or expansion of the paper. In this way, corrugation of the printed printing paper then results. This ultimately leads to a printing paper that can no longer be used. Therefore, despite the additional outlay, it was hitherto deemed to be necessary to use the printed paper layer at least partially resin treated and/or with an ink-reception layer for the application of the use as decor paper for planar components.

In connection with the present invention, it has now been established that the aforementioned problem can be solved by the printing paper being heated before, during and/or after printing and/or by the printing ink being heated immediately after being deposited on the printing paper. As a result of this heating, very rapid drying of the ink on the printing paper takes place, so that, depending on paper type and heating temperature, the aforementioned problems do not occur or occur only to a slight extent. In trials, it has been established that the printed result is virtually as good as when a printing paper with ink-reception layer is used. In the best case, the aforementioned heating leads to immediate drying of the ink on the printing paper as soon as the ink has been discharged by the print head and has been deposited on the upper side of the printing paper. In any case, by means of the present invention, the result is the quite important advantage that neither complicated partial resin treatment before printing nor the application of an ink-reception layer is required, so that the printing paper to be used in the invention is very economical.

In order to achieve rapid drying whilst taking the special features of the digital printing process into account, in particular when using water-based inks/printing inks, it is beneficial if the heating of the printing paper is performed from the upper side and/or lower side of the printing paper. In this case, the (drying) heating should preferably be performed at a temperature of more than 35°C, in particular between 40°C and 60°C. Very good results which, firstly, lead to rapid drying and, secondly, however, do not impair the print, have been achieved at temperatures between 49°C and 54°C.

Achieving an optimal printed result, beside the drying temperature, is also dependent on the drop size or the drop weight of the printing ink, on the one hand, and the printing speed, on the other hand. According to the invention, it has been established that the drop size of the printing ink during printing should be between 4.0 ng and 50 ng, while the printing speed should be higher than 3 m<sup>2</sup>/h. The printing speed is preferably between 4 and 50 m<sup>2</sup>/h, and in particular is between 6 and 30 m<sup>2</sup>/h.

In order to ensure the most effective heating and to prevent heating up surrounding equipment, the heating of the printing paper is performed in a drying room, which is located inside a housing which surrounds the printing device, i.e. the actual digital printer of the printing device. Ultimately, in this case this is a narrow, elongated housing corresponding approximately to the dimensions of the printer, which ultimately restricts the thermal energy applied during the heating to the area of the printer and the printing paper located there.

Since, during the drying of the printing ink, a comparatively large proportion of liquid evaporates, the invention provides for the air inside the drying room to be permanently circulated during the heating. Here, circulation is also understood to mean that fresh air is supplied and air loaded with moisture is discharged.

It goes without saying that the aforementioned method features in principle also relate to the use mentioned at the beginning.

Further features and advantages of the present invention can be gathered from the following description of an exemplary embodiment by using the drawing, which shows

a schematic side view of a digital printing device 1. The digital printing device 1 has a substructure 2 with a paper guide 3 for printing paper 4. Furthermore, the digital printing device 1 has a carriage guide 5, which is fixed to the substructure 2. The carriage guide 5 extends over the entire width of the substructure 2 and is located above the paper guide 3. A printer carriage 6 can be moved along the carriage guide 5. Connected to the printer carriage 6 is an ink tank 7, which can have an appropriate number of printing inks. The fact that the printer carriage 6 has at least one print head for spraying ink/printing ink onto the printing paper transported through the digital printing device 1 is not illustrated.

Connected upstream of the digital printing device 1 is a paper feed unit 8, while a paper discharge unit 9 is connected downstream. The printing paper 4 is supplied in roll form to the paper feed unit 8, is printed in the digital printing device 1 and is rolled up again as decor paper on the paper discharge unit 9. Following the completion of the printing, the rolled printed printing paper 4 or decor paper is removed from the paper discharge unit 9 and resin treated. The printing paper is then cut to the desired dimensions and is finally pressed with appropriate plates to form planar components for floor, wall, ceiling and/or furniture applications.

In the embodiment illustrated, it is now the case that two heating devices 10, 11 are provided to heat the printing paper 4 before, during and after the printing and also to heat the printing ink following the deposition on the printing paper 4. It goes without saying that, in principle, it is also possible to provide further heating devices, for example in the area of the paper feed unit or between the paper feed unit and the digital printing device 1.

The heating devices 10, 11 both extend at least substantially over the entire width of the paper guide 3. Therefore, the heating devices 10, 11 ultimately run transversely with respect to the conveying direction F. Since the paper guide 3 can have a maximum width of greater than 3 m, the two heating devices 10, 11 have a corresponding length. The heating device 10 is arranged after the print head or the print heads in the conveying direction F and serves in the first instance and substantially to dry the printing ink following the deposition on the upper side of the

printing paper 4. In the present case, the heating device 10 is constructed as an IR heater, which is assigned a blower 12 for the supply of fresh air. The blower 12 itself, the length of which corresponds at least substantially to the length of the heating device 10, is arranged above the heating device 10, both structural units in turn being arranged above the printer carriage 6. In order that the blower 12 and the thermal energy from the heating device 10 are aimed directly at the upper side of the just-printed printing paper 4, the blowing direction of the blower 12 is aimed vertically downwards. In order to assist this alignment, at least one guide plate 13, which is aimed vertically downwards, is provided. Finally, the heating device 10 and the blower 12 are located only a few centimetres after the print head of the printer carriage 6 in the conveying direction F, in order to be able to dry the deposited printing ink immediately after the deposition on the printing paper 4.

Since the heating device 10 is located in the vertical direction above the printer carriage 6, at least in some areas, and the printer carriage 6 is therefore subjected directly to the thermal influence of the heating device 10, located above the printer carriage 6 and also above the ink tank 7 there is a thermal protective covering 14, which in the present case is of angled or staircase design and thermally insulates the areas of printer carriage 6 and of ink tank 7 that are directly adjacent to the heating device 10. Here, it goes without saying that the width of the thermal protective covering 14 corresponds at least substantially to the width of the printer carriage 6. The thermal protective covering 14 is firmly connected to the printer carriage 6 and can be moved together with the latter.

Located in the substructure 2 of the digital printing device 1, in the area of the paper guide 3 and before the printer head in the conveying direction F of the printing paper 4, is the further heating device 11, which is provided to pre-heat the underside of the printing paper 4. In the exemplary embodiment illustrated, the further heating device 11 extends in the conveying direction F only until shortly before the printer carriage 6. However, in principle it is also possible for the further heating device 11 also to extend over a greater area of the paper guide 3, i.e. through until under the printer carriage 6.

Otherwise, in the embodiment illustrated it is such that the digital printing device 1, together with the heating device 10, is arranged in a housing 15, at least in some areas. The housing 15 extends at least substantially over the entire width of the digital printing device 1 and therefore ultimately runs transversely with respect to the conveying direction F. Apart from a slot, not illustrated in detail, for the printing paper 4 to be led through, the present housing 15, rectangular in cross section, is closed on the upper side and underside and on the front side and rear side. In this way, a drying room 16 results between the paper guide 3 and the housing 15 on the inner side. At the front, the housing 15 and therefore the drying room 16 are open, at least in some areas. In the figure, the one screen 17 on the front side is illustrated. The screen 17 ends above the printer carriage 6, so that the latter is accessible as necessary. A corresponding screen is provided on the opposite side. The housing 15 itself has a width between 40 cm and 50 cm and a height between 50 cm and 60 cm with a length which corresponds approximately to the length of the digital printing device 1. In the present case, the length of the digital printing device 1 is about 2.5 m, while the width of the paper feed unit is about 2.1 m.

According to the process, during the printing a temperature of about 52°C is applied via the heating device 10, and a temperature of about 50°C is applied via the further heating device 11. In this case, by means of the pre-heating of the underside of the printing paper 4, the further heating device 11 assists the drying of the printing ink following the deposition of the latter on the upper side of the printing paper 4.

The printing paper 4 itself is a resin-untreated paper that is free from an ink-reception layer on its printing side, on which the printing ink would run without the drying and which, on account of the high proportion of water in the printing ink 4, would expand and then corrugate without the drying, which would make further processing impossible.

**List of reference symbols**

- 1 Digital printing device
- 2 Substructure
- 3 Paper guide
- 4 Printing paper
- 5 Carriage guide
- 6 Printer carriage
- 7 Ink tank
- 8 Paper feed unit
- 9 Paper discharge unit
- 10 Heating device
- 11 Heating device
- 12 Blower
- 13 Guide plate
- 14 Thermal protective covering
- 15 Housing
- 16 Drying room
- 17 Screen
  
- F Conveying direction

## Szabadalmi igénypontok

1. Nyomatópapír alkalmazása dekorációs papírként síkfelületű elemekre, különösen padlóra, falra, mennyezetre vagy bútorra, amely nyomatópapírt egy (1) digitális nyomtatóeszközzel, digitális nyomtatási eljárással nyomtatjuk, és amely nyomatópapírt a nyomtatás előtt, közben és/vagy után felmelegítjük, és amely gyantával nem kezelt, és tintafelszívó rétegtől mentes, ahol a nyomatópapírt nyomtatás után gyantával kezeljük, a megfelelő méretűre vágjuk, és lemezekkel összenyomjuk, így a síkfelületű elemeket kapjuk.

2. Eljárás síkfelületű elemek előállítására, különösen padlón, falon, mennyezeten vagy bútoron való alkalmazásra, dekorációs papír alkalmazásával, ahol az előállításban egy mintát nyomtatunk a (4) nyomatópapírra digitális nyomtatási eljárással egy (1) digitális nyomtatóeszközzel, nyomdafesték felhasználásával, és ahol a (4) nyomatópapírt a nyomtatás előtt, közben és/vagy után felmelegítjük, és/vagy a nyomdafestéket a (4) nyomatópapírra kerülése után azonnal felmelegítjük,

azzal jellemezve, hogy

a nyomtatáshoz egy gyantával nem kezelt (4) nyomatópapírt használunk, amely tintafelszívó rétegtől mentes a nyomtatási oldalán, és a nyomatópapírt nyomtatás után gyantával kezeljük, a megfelelő méretűre vágjuk, és lemezekkel összenyomjuk, hogy a síkfelületű elemeket kapjuk.

3. A 2. igénypont szerinti eljárás, azzal jellemezve, hogy a (4) nyomatópapír melegítését a (4) nyomatópapír felső részétől és/vagy az alsó részétől kezdve végezzük, és/vagy a melegítés következtében szárítjuk is  $35^{\circ}\text{C}$  felett, különösen  $40^{\circ}\text{C}$  és  $60^{\circ}\text{C}$  között.

4. Az előző igénypontok bármelyike szerinti eljárás, azzal jellemezve, hogy a nyomdafesték csepp súlya a nyomtatás alatt  $4,0\text{ ng}$  és  $50\text{ ng}$  közötti, és a nyomtatási sebesség  $3\text{ m}^2/\text{óránál}$  magasabb, előnyösen  $4$  és  $50\text{ m}^2/\text{óra}$  közötti, és különösen  $6$  és  $30\text{ m}^2/\text{óra}$  közötti.

5. Az előző igénypontok bármelyike szerinti eljárás, azzal jellemezve, hogy nyomdafestékként oldószert tartalmazó vagy vizet tartalmazó tintát használunk.

6. Az előző igénypontok bármelyike szerinti eljárás, azzal jellemezve, hogy a (4) nyomatópapír melegítését egy (16) szárítókamrában végezzük, amely egy (15) burkolatot képez az (1) digitális nyomtatóeszköz körül, és a melegítés közben előnyösen állandóan keringetjük a levegőt a (16) szárítókamra belsejében.

