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(54) **TEXTILE DOUBLE-SIDED INKJET PRINTING METHOD USING DIGITAL INKJET PRINTER, AND TEXTILE**

TEXTILDOPPELSEITIGES TINTENSTRAHLDRUCKVERFAHREN UNTER VERWENDUNG EINES DIGITALEN TINTENSTRAHLDRUCKERS UND TEXTIL

PROCÉDÉ D'IMPRESSION À JET D'ENCRE RECTO VERSO SUR TEXTILE UTILISANT UNE IMPRIMANTE À JET D'ENCRE NUMÉRIQUE ET TEXTILE

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(73) Proprietor: **Hangzhou Honghua Digital Technology Stock Co., Ltd**
**Hangzhou, Zhejiang 310052 (CN)**

(72) Inventors:
- **XU, Liming**
  **Zhejiang 310052 (CN)**
- **HUANG, Yuyuan**
  **Zhejiang 310052 (CN)**

(74) Representative: **Weickmann & Weickmann PartmbB**
**Postfach 860 820**
**81635 München (DE)**

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## Description

**[0001]** The present application claims priority to Chinese Patent Application No. 201711248858.X, titled "METHOD FOR PERFORMING DOUBLE-SIDED INKJET PRINTING METHOD ON TEXTILE BY DIGITAL INKJET PRINTER AND TEXTILE", filed on December 1, 2017 with the Chinese Patent Office.

## FIELD

**[0002]** The present disclosure relates to the field of textile printing, and in particular to a method for performing double-sided inkjet printing on the textile.

## BACKGROUND

**[0003]** With the increasing development of computer technology, a digital printing technology is developed, which is a high technology combining the machinery technology, the computer technology and the electronic information technology, and in which printing is performed via the digital technology. With the development and improvement of the digital printing technology, a great development is to be achieved in the textile printing industries.

**[0004]** A current digital inkjet printer for performing digital printing generally includes a digital inkjet printing head, a guiding belt and a control system. In practice, a to-be-printed textile is arranged on the guiding belt, a target pattern is inputted to the control system, and the control system controls the digital inkjet printing head to print the target pattern on the textile.

**[0005]** In some cases, it is required to print patterns on both sides of the textile, that is, a front side and a back side of the textile, to prevent an adverse effect to the character of the textile due to unaesthetic single-sided printed pattern. However, in the conventional technology, it is difficult to ensure that a pattern on the front side is superposed and aligned with that on the back side. For example, in the conventional technology, in order to achieve double sided printing, a dye with good permeability is used to firstly print a pattern on one side of the textile, and the dye is permeated through the textile to form a pattern on the other side of the textile. However, the dye with good permeability may permeate across the textile, which may affect the character of the textile. In another conventional method, paintings are separately performed on the two sides of the textile respectively via two rollers. However, with this method, it is difficult to align the patterns on the two sides of the textile with each other, which may affect the appearance of the textile. In addition, taking a case that printing is performed on the front side and the back side of the textile with the digital printing technology as an example, reference is made to Figures 5 and 6. Figure 5 schematically shows a target pattern. Figure 6 schematically shows a textile a front side of which is printed and a back side of which is arranged upward. In Figure 6, the textile is made of a flexible material, and the textile is easily distorted and deformed when being left aside, thus once being inverted, it is difficult to maintain the textile to be located in the same state as in the previous arrangement. In this case, it is impossible to ensure that the pattern on the front side is aligned with that on the back side just by printing the target pattern on the back side of the textile by the digital inkjet printer with a conventional method.

**[0006]** A method for producing a double-sided inkjet printed textile of pure cotton is disclosed in a Chinese Patent Publication No. CN105926331A, published on September 7, 2016, which includes the following steps 1) to 6).

**[0007]** In step 1), a pretreatment process is performed, in which a singeing process, a desizing process, a scouring process, an oxidation bleaching process and a mercerizing process are performed sequentially. In the mercerizing process, a concentration of NaOH ranges from 180g/L to 320g/L.

**[0008]** In step 2), the textile is pretreated. The textile is sized with a padding method. In a sizing agent, a concentration of Na2CO3 ranges from 20g/L to 40g/L, a concentration of carbamide ranges from 60g/L to 90g/L, a concentration of a sizing material Lyoprint RD-HT ranges from 12g/L to 25g/L, a concentration of a sizing material Lyoprint ATP-30 ranges from 15g/L to 25g/L, a concentration of an antireducer LyoprintRG ranges from 2g/L to 15g/L, and a concentration of a permeability-reducing admixture HPU liq ranges from 6g/L to 12g/L. After the textile is sized, the textile is pre-dried at 80 degree Celsius to 90 degree Celsius, then the textile is dried at 100 degree Celsius to 120 degree Celsius. After being dried, the textile is rolled orderly.

**[0009]** In step 3), inkjet printing is performed on one side of the textile by a reactive inkjet printer, and the textile is dried and rolled orderly.

**[0010]** In step 4), the inkjet printing is performed on the other side of the textile by the reactive inkjet printer, and the textile is dried.

**[0011]** In step 5), the textile is steamed at 102 degree Celsius for 10 minutes to 14 minutes. After being steamed, the textile is washed, to remove loose colors and auxiliaries on the surfaces of the textile.

**[0012]** In step 6), the textile is softened and preshrunk.

**[0013]** The method in the above application is only suitable for producing a textile having different patterns on the two sides, and cannot satisfy requirements for double-sided printed textile having patterns that are superposed and aligned with each other on the two sides. With the increasing demand of customers on the double-sided printing process for a textile, it has become a main index in determining the printing quality and aesthetics of a thin or translucent textile that whether a pattern on the front side is superposed and aligned with a pattern on the back side, which directly affects the character of a printed product. However, it is difficult to ensure alignment and superposition between the printed pattern on the front side

and the printed pattern on the back side in the conventional printing technology.

**[0014]** The patent application No. US2009284776 provides a process and apparatus for double-face ink-printing canvases for advertising light boxes. The process includes: disposing a print head at a side of an ink print workbench, an unprinted face of a reverse side of the canvas facing to the print head; disposing an inductor at the other side of the ink print workbench, a printed face of an obverse side of the canvas facing to the inductor; collecting image data of the printed face by the inductor during conveying the canvas and transmitting the image data to a signal processing device to process, and after time sequence processing, determining print positions on the unprinted face depending on results of the processing; and driving the print head to print on the determined print positions on the unprinted face by a print driving device, for achieving the double-faced ink print on the canvas for the advertising light boxes.

**[0015]** The patent application No. CN107264028 discloses a recording apparatus (1), which includes a transport belt (10) that transports a medium (P), a recording unit (7) that performs recording on the medium supported by the transport belt, a plurality of imaging units (18a, 18b) provided on an upstream side and a downstream side in a transport direction of the medium, and configured to shoot a moving object including at least one of the transport belt and the medium, and a calculation unit that calculates a distance travelled by the transport belt in a predetermined time, on a basis of a position of a part of the moving object in an image picked up by the upstream imaging unit of the plurality of imaging units, and a position of the part of the moving object in an image picked up by the downstream imaging unit of the plurality of imaging units, the predetermined time after the image pickup by the upstream imaging unit.

**[0016]** The patent application No. EP3056348 provides a digital type duplex printing method of printing images on both sides of a printing material such that a front-side image and a back-side image overlap each other. The digital type duplex printing method performs duplex printing with a digital type printer 10 which includes a print head 11 for performing printing by moving with respect to a printing material 50 and allows a printing jig 20 for setting the printing material 50 to be installed at a predetermined position such that the printing jig can be reversed. The printing material 50 is fixed in a stretched state to the printing jig 20, which is installed at the predetermined position. On the front surface of the printing material 50, a front-side image 31 and a front-side position detection mark 32 are printed. The printing jig 20 is inverted and is installed at the predetermined position. On the back surface of the printing material 50, a back-side position detection mark 42 is printed. The back-side position detection mark 42 and the front-side position detection mark 32 are compared from any one of the front surface and the back surface, and the relative position of the back-side image to the front-side image of the printing material 50 is corrected on the basis of the comparison. A back-side image 41 is printed at the corrected relative position on the back surface of the printing material 50.

## SUMMARY

**[0017]** To solve the above problem, a textile and a method for performing double-sided inkjet printing on the textile by a digital inkjet printer are provided according to the embodiments of the present disclosure, to achieve alignment and superposition between a pattern on a front side of the textile and a pattern on a back side of the textile during performing the double-sided inkjet printing on the textile, thereby significantly improving satisfaction of a customer on the textile.

**[0018]** A method for performing double-sided inkjet printing on a textile by a digital inkjet printer is provided according to an embodiment of the present disclosure.

**[0019]** The digital inkjet printer includes a digital inkjet printing head, a control system, a pattern collecting unit and a material feeding device. The digital inkjet printing head is configured to perform inkjet printing based on a target pattern. The control system includes a storage unit, a processing unit and a control unit. The storage unit is configured to store data. The processing unit is configured to receive, process and transmit data. The control unit is configured to control the processing unit to process the data and transmit a printing signal. The pattern collecting unit is configured to collect a pattern on the textile and transmit the collected pattern to the storage unit of the control system. The material feeding device includes a rack and a guiding belt arranged on the rack. A printing region is arranged on the guiding belt, and the digital inkjet printing head is arranged above the printing region.

**[0020]** The method includes:

inputting a target pattern for performing double-sided inkjet printing to the storage unit of the control system;

performing a mirroring process on the target pattern to obtain a mirrored target pattern, and storing the mirrored target pattern in the storage unit;

arranging the textile in the printing region of the guiding belt, transmitting a printing signal to the digital inkjet printing head by the control unit, and printing the stored target pattern on a front side of the textile by the digital inkjet printing head, to form a front printed pattern;

inverting the textile and arranging the inverted textile on the guiding belt, collecting, by the pattern collecting unit, a back pattern on a back side of the textile which is formed by permeation and is inverted to the front printed pattern on the front side of the textile, and transmitting the collected back pattern to the

storage unit by the pattern collecting unit;

adjusting the mirrored target pattern obtained in step 2) by the processing unit, to align the mirrored target pattern with the back pattern collected by the pattern collecting unit; and

printing the adjusted mirrored target pattern on the back side of the textile by the digital inkjet printing head,

the adjusting the mirrored target pattern by the processing unit includes:

a. determining a plurality of feature points on the mirrored target pattern;

b. recognizing, by the processing unit and on the back pattern collected by the pattern collecting unit, feature points each of which is located corresponding to one of the plurality of feature points on the mirrored target pattern, and calculating a deviation between each of the feature points obtained in step b and the corresponding one feature point obtained in step a; and

c. adjusting, by the processing unit, the mirrored target pattern based on the deviation obtained in step b, to align each of the feature points on the mirrored target pattern with the corresponding one feature point on the back pattern collected by the pattern collecting unit, to align the mirrored target pattern with the back pattern collected by the pattern collecting unit.

**[0021]** In the present disclosure, "the front side" and "the back side" of the textile do not indicate a specific meaning. That is, one side of the textile is designated as a front side, and the other side of the textile is designated as a back side.

**[0022]** Preferably, after the target pattern is printed on the front side of the textile, the method further includes: performing a dry process on the textile.

**[0023]** Preferably, before determining the feature points on the mirrored target pattern, a grayscale process is performed on the mirrored target pattern, to obtain a grayscale template of the mirrored target pattern.

**[0024]** Preferably, the pattern collecting unit is a scanning device or a camera.

**[0025]** Preferably, the guiding belt is arranged with a heat sensitive adhesive or a pressure sensitive adhesive, to adhesively spread the textile flat on the guiding belt.

**[0026]** Preferably, the feature points are determined in a manner of 0.5 to 3 feature points every 6.4516 square centimeters (0.5 to 3 feature points per square inch) for aligning and positioning, and no feature point is determined at a region of a single color on the mirrored target pattern in which the mirrored target pattern has no change.

**[0027]** The digital inkjet printer further includes a movable unit. The movable unit is configured to move in a direction perpendicular to a feeding direction of the guiding belt. The digital inkjet printing head and the pattern collecting unit are arranged on the movable unit. The pattern collecting unit is configured to move along with the movable unit and collect the back pattern in real time.

**[0028]** Preferably, if the deviation for aligning the mirrored target pattern with the back pattern collected by the pattern collecting unit is larger than a preset value, it is determined whether the mirrored target pattern is aligned with the back pattern collected by the pattern collecting unit through manual observation. If it is determined that the mirrored target pattern is not aligned with the back pattern collected by the pattern collecting unit, the mirrored target pattern is adjusted manually through manual intervention, to align each of the feature points on the mirrored target pattern with the corresponding one feature point on the back pattern collected by the pattern collecting unit..

**[0029]** Preferably, the feature points are determined on the mirrored target pattern in a manner of one feature point every 6.4516 square centimeters (one feature point per square inch) at a position required to be aligned

Compared with the conventional technology, the following advantages and beneficial effects can be achieved according to the present disclosure. With the method for performing double-sided inkjet printing on a textile, the target pattern is firstly printed onto the front side of the textile, then the textile is inverted. Before printing a mirrored target pattern, a back pattern on the back side of the textile is collected, which is formed by permeation of dye from the front side to the back side of the textile, and the mirrored target pattern is adjusted to be aligned with the collected back pattern, then the adjusted mirrored target pattern is printed. In this way, it is ensured the alignment and superposition between patterns on two sides of the textile, thereby solving the problem in the conventional double-sided printing method that patterns on two sides of the textile cannot be aligned and superposed with each other, thus improving the quality of the double-sided printing for the textile and making printing color more abundance satiation.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0030]** In order to more clearly illustrate technical solutions in embodiments of the present disclosure or in the conventional technology, the drawings to be used in the description of the embodiments or the conventional technology are briefly described below. Apparently, the drawings in the following description show only some embodiments of the present disclosure, and other drawings may be obtained by those skilled in the art from the drawings without any creative work.

Figure 1 schematically shows a control principle ac-

cording to a first embodiment;

Figure 2 schematically shows a hardware structure according to the first embodiment;

Figure 3 schematically shows a process flowchart according to a second embodiment;

Figure 4 schematically shows a front side and a back side of a textile according to a third embodiment;

Figure 5 schematically shows an example of a target pattern; and

Figure 6 schematically shows a textile a front side of which is printed and a back side of which is arranged upward.

## DETAILED DESCRIPTION OF EMBODIMENTS

**[0031]** The present disclosure is described in detail below through embodiments with reference to the drawings. The following embodiments are used to explain the present disclosure other than intend to limit the present disclosure.

**[0032]** It should be further noted that positional terms such as up, down, left, right, front, back are only referred to relative concepts in the drawings or a normal usage state of a product and are not restrictive.

First Embodiment

**[0033]** Reference is made to the embodiments described in the drawings. In order to obtain a comprehensive understanding of the present disclosure, various specific details are described in the following description. However, those skilled in the art should understand that the present disclosure may be implemented without those details.

**[0034]** As shown in Figures 1 and 2, in this embodiment, a digital inkjet printer includes a digital inkjet printing head 1, a control system 2, a pattern collecting unit 3 and a material feeding device 4. The digital inkjet printing head 1 is connected to the control system 2. The pattern collecting unit 3 is connected to the control system 2. In addition, the digital inkjet printer further includes a peripheral interface, a display screen, and an external port, which are not described in detail herein. Components shown in Figure 1 may be implemented as hardware, software or a combination of the hardware and the software. Each of the components shown in Figure 1 includes one or more signal processing and/or specific integrated circuits.

**[0035]** In this embodiment, the digital inkjet printing head 1 is configured to perform inkjet printing based on a target pattern.

**[0036]** In this embodiment, the control system 2 includes a storage unit 21, a processing unit 22 and a control unit 23. The storage unit 21 is configured to store data, which includes but is not limited to a target pattern inputted from an external device, a mirrored target pattern and a back pattern collected in a real time. The pattern collecting unit 32 is connected to the storage unit 21. The processing unit 22 is configured to receive, process and transmit data. The processing on data includes but is not limited to determining feature points, performing a mirroring process on the target pattern, obtaining the mirrored target pattern, aligning the mirrored target pattern with the collected back pattern and converting the target pattern into a grayscale template. The processing unit 22 is connected to the storage unit 21. The control unit 23 is configured to control the processing unit 22 to process data and transmit a printing signal. The control unit 23 is connected to the processing unit 22 and the digital inkjet printing head 1. The above components may be implemented as hardware, software or a combination of the hardware and the software. Each of the above components includes one or more signal processing and/or specific integrated circuits.

**[0037]** In this embodiment, the pattern collecting unit 3 is configured to collect a pattern on a textile and transmit the collected pattern to the storage unit 21 of the control system 2. The pattern collecting unit 3 may be a scanning device or a camera, as long as the pattern collecting unit 3 is capable of collecting a pattern on the textile.

**[0038]** In this embodiment, the material feeding device 4 includes a rack 41 and a guiding belt 42. The guiding belt 42 is arranged on the rack 41. A printing region is arranged on the guiding belt 42. The digital inkjet printing head 1 is arranged above the printing region. The guiding belt 42 is rotated by a power device to feed material. Specifically, the power device may include a motor, a driving pulley, and a slave pulley. The motor is connected to the driving pulley and is configured to control the driving pulley to rotate. The guiding belt is looped over the driving pulley and the slave pulley, such that the slave pulley is rotated following the driving pulley.

**[0039]** In this embodiment, a heat sensitive adhesive or a pressure sensitive adhesive is arranged on the guiding belt 42, such that the textile may be spread flat and fixed on the guiding belt 42 when being arranged on the guiding belt 42, thereby preventing the textile from partially arching or crinkling, thus facilitating inkjet printing and ensuring accuracy of the inkjet printing.

**[0040]** In this embodiment, the digital inkjet printer further includes a movable unit 5. The movable unit 5 is configured to move in a direction perpendicular to a feeding direction of the guiding belt 42. The digital inkjet printing head 1 and the pattern collecting unit 3 are arranged on the movable unit 5. There is a certain distance between the pattern collecting unit 3 and the digital inkjet printing head 1 in the feeding direction of the guiding belt. The pattern collecting unit 3 is configured to move along with the movable unit and collects the pattern in real time. After one material feeding process is performed via the guiding belt 42, the digital inkjet printing head 1 performs

inkjet printing once via the movable unit 5. In addition, the pattern collecting unit 3 collects a back pattern of the to-be-printed textile.

Second Embodiment

**[0041]** In this embodiment, a method for performing double-sided inkjet printing on a textile by the above digital inkjet printer is provided, which includes the following steps 1) to 7).

**[0042]** In step 1), a textile is arranged. The textile is adhesively spread on the guiding belt 42 of the material feeding device 4. The guiding belt 42 is arranged with a heat sensitive adhesive or a pressure sensitive adhesive, to prevent the textile from moving or crinkling.

**[0043]** In step 2), a target pattern is inputted and printed. The target pattern is inputted to the storage unit 21 of the control system 2. The control unit 23 transmits a printing signal to the digital inkjet printing head 1, to print the stored target pattern on a front side of the textile by the digital inkjet printing head 1, and the textile is dried. The target pattern may be inputted before performing step 1).

**[0044]** In step 3), the textile is inverted and is arranged. After the target pattern is printed on the front side of the textile, the textile is inverted and is arranged on the guiding belt 42, such that a back side of the textile which is not printed is arranged toward the digital inkjet printing head 1.

**[0045]** In step 4), a mirroring process is performed on the target pattern. The processing unit 22 performs the mirroring process on the target pattern, to obtain a mirrored target pattern, and stores the mirrored target pattern in the storage unit 21. Step 4) may be performed at any time before the back side of the textile is printed. The mirror process may be performed on the target pattern by a computer outside this system, and the mirrored target pattern is duplicated in this system for subsequent use.

**[0046]** In step 5), a pattern on the textile is collected. The pattern collecting unit 3 collects a pattern on the back side of the textile which is not printed. This pattern is formed by permeation of dye from the front side of the textile to the back side of the textile, that is, a back pattern converted to the target pattern on the front side of the textile. The pattern collecting unit 3 transmits the collected back pattern to the storage unit 21.

**[0047]** In step 6), the mirrored target pattern is adjusted. The processing unit 22 adjusts the mirrored target pattern, to align the mirrored target pattern with the back pattern collected by the pattern collecting unit 3 (that is, feature points on the mirrored target pattern are paired with feature points on the collected back pattern and a feature point on the mirrored target pattern which is not aligned with a paired feature point on the collected back pattern is adjusted to be aligned with the paired feature point), such that an actually outputted target pattern is completely superposed with the collected pattern. In a case that the front side of the textile is printed and the back side of the textile is arranged upward on the guiding belt 42, the textile may be stretched and the pattern printed on the textile may be distorted or deformed. In this case, the processing unit 22 adjusts the mirrored target pattern based on the collected back pattern, to completely align a pattern on the back side of the textile with the pattern on the front side of the textile, thereby solving the problem in the conventional technology that it is impossible to exactly align a pattern on the back side of the textile with the pattern on the front side of the textile.

**[0048]** In step 7), the back side of the textile is printed. The adjusted mirrored target pattern is printed on the back side of the textile by the digital inkjet printing head 1. After step 7) is performed, a dry process may be performed as needed.

**[0049]** Specifically, in step 6), the processing unit 22 adjusts the mirrored target pattern through the following steps a, b and c.

**[0050]** In step a, multiple feature points are determined on the mirrored target pattern.

**[0051]** In step b, the processing unit 22 recognizes, on the back pattern collected by the pattern collecting unit 3, feature points each of which is located corresponding to one of the feature points on the mirrored target pattern and calculates a deviation between each of the feature points obtained in step b and the corresponding one feature point obtained in step a.

**[0052]** In step c, the processing unit 22 adjusts the mirrored target pattern based on the deviation obtained in step b, to align each of the feature points on the mirrored target pattern with the corresponding one feature point on the back pattern collected by the pattern collecting unit 3, such that the mirrored target pattern is aligned with the back pattern collected by the pattern collecting unit 3.

**[0053]** In this embodiment, after step 2) is performed, a dry process is performed on the textile, to prevent a case in which subsequent processes are performed before the dye is dried, which may affects the quality of the printing.

**[0054]** In this embodiment, in step a, the mirrored target pattern is converted into a grayscale template before determining the feature points on the mirrored target pattern, where a resolution of a processed pattern may be 150DPI or 300DPI. With this process, pixels of the mirrored target pattern are reduced, thereby increasing a processing speed of the processing unit 22, thus improving operating efficiency. However, a color pattern may be directly used without being converted into the grayscale template, which may result in a slow recognizing speed, while have an advantage that a color pattern with any colors may be recognized (however, it is difficult to recognize a color pattern with certain colors).

**[0055]** In this embodiment, in step a, the feature points are determined in a manner of 0.5 to 3 feature points every 6.4516 square centimeters (0.5 to 3 feature points per square inch), and points that are easy to be aligned

and positioned on the pattern are determined as features points, such as a point at a junction of lines or a corner of lines.

**[0056]** In this embodiment, in step c, if the deviation for aligning the mirrored target pattern with the back pattern collected by the pattern collecting unit 3 is large, it is determined whether the mirrored target pattern is aligned with the back pattern collected by the pattern collecting unit 3 through manual observation. If it is determined that the mirrored target pattern is not aligned with the back pattern collected by the pattern collecting unit 3, the mirrored target pattern is adjusted manually through manual intervention, to align each of the feature points on the mirrored target pattern with the corresponding one feature point on the back pattern collected by the pattern collecting unit 3. In order to align the feature point on the mirrored target pattern with the corresponding one feature point on the back pattern collected by the pattern collecting unit 3, the above manual observation process may be replaced by an automatic detection and an automatic skip process performed by the processing unit 22.

**[0057]** Preferably, in step a, the feature points are determined in a manner of one feature point every 6.4516 square centimeters (one feature point per square inch). A large number of feature points may lead to a high accuracy in alignment, while result in a large calculating amount.

**[0058]** In this embodiment, multiple mirrored target patterns may be spread flat and successively, to achieve continuous printing, thereby improving printing efficiency.

Third Embodiment

**[0059]** As shown in Figure 4, a textile is provided in this embodiment. The textile has a front printed pattern and a back printed pattern. The front printed pattern is arranged on a front side of the textile and the back printed pattern is arranged on a back side of the textile, and the front printed pattern and the back printed pattern are aligned with each other. The front printed pattern and the back printed pattern are formed with the method for performing double-sided inkjet printing described in the second embodiment.

**[0060]** In this embodiment, the front printed pattern has feature points, and the back printed pattern has feature points located respectively corresponding to the feature points on the front printed pattern.

**[0061]** In this embodiment, the textile may be applied for producing silk scarves, scarves, cloths or the like.

**[0062]** The above parts of the description falling outside the scope of the claims are merely examples.

## Claims

**1.** A method for performing double-sided inkjet printing on a textile by a digital inkjet printer, wherein the digital inkjet printer comprises:

a digital inkjet printing head (1) configured to perform inkjet printing based on a target pattern;
a control system (2) comprising a storage unit (21), a processing unit (22) and a control unit (23), wherein the storage unit (21) is configured to store data, the processing unit (22) is configured to receive, process and transmit data, and the control unit (23) is configured to control the processing unit to process the data and transmit a printing signal;
a pattern collecting unit (3) configured to collect a pattern on the textile and transmit the collected pattern to the storage unit (21) of the control system (2); and
a material feeding device (4) comprising a rack (41) and a guiding belt (42) arranged on the rack, wherein a printing region is arranged on the guiding belt, and the digital inkjet printing head (1) is arranged above the printing region,
wherein the method comprises:

1) inputting a target pattern for performing double-sided inkjet printing to the storage unit of the control system;
2) performing a mirroring process on the target pattern to obtain a mirrored target pattern, and storing the mirrored target pattern in the storage unit;
3) arranging the textile in the printing region of the guiding belt, transmitting a printing signal to the digital inkjet printing head by the control unit, and printing the stored target pattern on a front side of the textile by the digital inkjet printing head, to form a front printed pattern;
4) inverting the textile and arranging the inverted textile on the guiding belt, collecting, by the pattern collecting unit, a back pattern on a back side of the textile which is formed by permeation and is inverted to the front printed pattern on the front side of the textile, and transmitting the collected back pattern to the storage unit by the pattern collecting unit;
5) adjusting the mirrored target pattern obtained in step 2) by the processing unit, to align the mirrored target pattern with the back pattern collected by the pattern collecting unit; and
6) printing the adjusted mirrored target pattern on the back side of the textile by the digital inkjet printing head,

wherein in step 5), the adjusting the mirrored target pattern by the processing unit comprises:

a. determining a plurality of feature points on the mirrored target pattern;
b. recognizing, by the processing unit and on the back pattern collected by the pattern collecting unit, feature points each of which is located corresponding to one of the plurality of feature points on the mirrored target pattern, and calculating a deviation between each of the feature points obtained in step b and the corresponding one feature point obtained in step a; and
c. adjusting, by the processing unit, the mirrored target pattern based on the deviation obtained in step b, to align each of the feature points on the mirrored target pattern with the corresponding one feature point on the back pattern collected by the pattern collecting unit, to align the mirrored target pattern with the back pattern collected by the pattern collecting unit.

**2.** The method for performing double-sided inkjet printing on a textile by a digital inkjet printer according to claim 1, further comprising:
after step 3), performing a dry process on the textile.

**3.** The method for performing double-sided inkjet printing on a textile by a digital inkjet printer according to claim 1, wherein in step a, before determining the feature points on the mirrored target pattern, the mirrored target pattern is converted into a grayscale template.

**4.** The method for performing double-sided inkjet printing on a textile by a digital inkjet printer according to claim 1, wherein the pattern collecting unit (3) is a scanning device or a camera.

**5.** The method for performing double-sided inkjet printing on a textile by a digital inkjet printer according to claim 1, wherein the guiding belt (42) is arranged with a heat sensitive adhesive or a pressure sensitive adhesive, to spread the textile flat on the guiding belt (42).

**6.** The method for performing double-sided inkjet printing on a textile by a digital inkjet printer according to claim 1, wherein in step a, the feature points are determined in a manner of 0.5 to 3 feature points per 6.4516 square centimeters (0.5 to 3 feature points per square inch) for aligning and positioning, and no feature point is determined at a region of a single color on the mirrored target pattern in which the mirrored target pattern has no change.

**7.** The method for performing double-sided inkjet printing on a textile by a digital inkjet printer according to claim 1, wherein the digital inkjet printer further comprises a movable unit (5) configured to be movable in a direction perpendicular to a feeding direction of the guiding belt (42), and wherein
the digital inkjet printing head (1) and the pattern collecting unit (3) are arranged on the movable unit (5), and the pattern collecting unit (3) is configured to move along with the movable unit (5) and collect the back pattern in real time.

**8.** The method for performing double-sided inkjet printing on a textile by a digital inkjet printer according to claim 1, wherein in step c, in a case that the deviation for aligning the mirrored target pattern with the back pattern collected by the pattern collecting unit is larger than a preset value, it is determined whether the mirrored target pattern is aligned with the back pattern collected by the pattern collecting unit through manual observation,
if it is determined that the mirrored target pattern is not aligned with the back pattern collected by the pattern collecting unit, the mirrored target pattern is adjusted manually through manual intervention, to align each of the feature points on the mirrored target pattern with the corresponding one feature point on the back pattern collected by the pattern collecting unit.

**9.** The method for performing double-sided inkjet printing on a textile by a digital inkjet printer according to claim 6, wherein in step a, the feature points are determined in a manner of one feature point per 6.4516 square centimeters (one feature point per square inch) at a position to be aligned.

**Patentansprüche**

**1.** Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker, wobei der digitale Tintenstrahldrucker umfasst:

einen digitalen Tintenstrahldruckkopf (1), der so konfiguriert ist, dass er einen Tintenstrahldruck auf der Grundlage eines Zielmusters durchführt;
ein Steuersystem (2), das eine Speichereinheit (21), eine Verarbeitungseinheit (22) und eine Steuereinheit (23) umfasst, wobei die Speichereinheit (21) so konfiguriert ist, dass sie Daten speichert, die Verarbeitungseinheit (22) so konfiguriert ist, dass sie Daten empfängt, verarbeitet und überträgt, und die Steuereinheit (23) so konfiguriert ist, dass sie die Verarbeitungseinheit steuert, um die Daten zu verarbeiten und ein Drucksignal zu übertragen;
eine Mustersammeleinheit (3), die konfiguriert ist, um ein Muster auf dem Textil zu sammeln und das gesammelte Muster an die Speicher-

einheit (21) des Steuersystems (2) zu übertragen; und
eine Materialzuführungsvorrichtung (4), die ein Gestell (41) und ein auf dem Gestell angeordnetes Führungsband (42) umfasst, wobei auf dem Führungsband ein Druckbereich angeordnet ist und der digitale Tintenstrahldruckkopf (1) oberhalb des Druckbereichs angeordnet ist,
wobei das Verfahren umfasst:

1) Eingeben eines Zielmusters zur Durchführung eines doppelseitigen Tintenstrahldrucks in die Speichereinheit des Steuersystems;
2) Durchführen eines Spiegelungsprozesses an dem Zielmuster, um ein gespiegeltes Zielmuster zu erhalten, und Speichern des gespiegelten Zielmusters in der Speichereinheit;
3) Anordnen des Textils im Druckbereich des Führungsbandes, Übertragen eines Drucksignals an den digitalen Tintenstrahldruckkopf durch die Steuereinheit und Drucken des gespeicherten Zielmusters auf eine Vorderseite des Textils durch den digitalen Tintenstrahldruckkopf, um ein vorderes Druckmuster zu bilden;
4) Umdrehen des Textils und Anordnen des umgedrehten Textils auf dem Führungsband, Sammeln eines hinteren Musters auf einer Rückseite des Textils durch die Mustersammeleinheit, das durch Permeation gebildet wird und zum vorderen gedruckten Muster auf der Vorderseite des Textils invertiert ist, und Übertragen des gesammelten hinteren Musters an die Speichereinheit durch die Mustersammeleinheit;
5) Anpassen des in Schritt 2) erhaltenen gespiegelten Zielmusters durch die Verarbeitungseinheit, um das gespiegelte Zielmuster mit dem durch die Mustersammeleinheit gesammelten hinteren Muster auszurichten; und
6) Drucken des angepassten gespiegelten Zielmusters auf die Rückseite des Textils durch den digitalen Tintenstrahldruckkopf,

wobei in Schritt 5) das Anpassen des gespiegelten Zielmusters durch die Verarbeitungseinheit umfasst:

a. Bestimmen einer Vielzahl von Merkmalspunkten auf dem gespiegelten Zielmuster;
b. Erkennen von Merkmalspunkten durch die Verarbeitungseinheit und auf dem von der Mustersammeleinheit gesammelten hinteren Muster, von denen jeder entsprechend einem der Vielzahl von Merkmalspunkten auf dem gespiegelten Zielmuster angeordnet ist, und Berechnen einer Abweichung zwischen jedem der in Schritt b erhaltenen Merkmalspunkte und dem entsprechenden in Schritt a erhaltenen einen Merkmalspunkt; und
c. Anpassen des gespiegelten Zielmusters durch die Verarbeitungseinheit auf der Grundlage der in Schritt b erhaltenen Abweichung, um jeden der Merkmalspunkte auf dem gespiegelten Zielmuster mit dem entsprechenden einen Merkmalspunkt auf dem von der Mustersammeleinheit gesammelten hinteren Muster auszurichten, um das gespiegelte Zielmuster mit dem von der Mustersammeleinheit gesammelten hinteren Muster auszurichten.

**2.** Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker nach Anspruch 1, ferner umfassend:
nach Schritt 3), Durchführen eines Trockenprozesses auf dem Textil.

**3.** Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker nach Anspruch 1, wobei in Schritt a) vor der Bestimmung der Merkmalspunkte auf dem gespiegelten Zielmuster das gespiegelte Zielmuster in eine Graustufenvorlage umgewandelt wird.

**4.** Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker nach Anspruch 1, wobei die Mustersammeleinheit (3) eine Abtastvorrichtung oder eine Kamera ist.

**5.** Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker nach Anspruch 1, wobei das Führungsband (42) mit einem wärmeempfindlichen Klebstoff oder einem druckempfindlichen Klebstoff versehen ist, um das Textil flach auf dem Führungsband (42) auszubreiten.

**6.** Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker nach Anspruch 1, wobei in Schritt a die Merkmalspunkte in einer Weise von 0,5 bis 3 Merkmalspunkten pro 6,4516 Quadratzentimeter (0,5 bis 3 Merkmalspunkte pro Quadratzoll) zum Ausrichten und Positionieren bestimmt werden und kein Merkmalspunkt in einem Bereich einer einzelnen Farbe auf dem gespiegelten Zielmuster bestimmt wird, in dem das gespiegelte Zielmuster keine Veränderung aufweist.

7. Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker nach Anspruch 1, wobei der digitale Tintenstrahldrucker ferner eine bewegliche Einheit (5) umfasst, die so konfiguriert ist, dass sie in einer Richtung senkrecht zu einer Vorschubrichtung des Führungsbandes (42) beweglich ist, und wobei
der digitale Tintenstrahldruckkopf (1) und die Mustersammeleinheit (3) auf der beweglichen Einheit (5) angeordnet sind, und die Mustersammeleinheit (3) so konfiguriert ist, dass sie sich zusammen mit der beweglichen Einheit (5) bewegt und das hintere Muster in Echtzeit sammelt.

8. Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker nach Anspruch 1, wobei in Schritt c in einem Fall, in dem die Abweichung für das Ausrichten des gespiegelten Zielmusters mit dem von der Mustersammeleinheit gesammelten hinteren Muster größer als ein voreingestellter Wert ist, bestimmt wird, ob das gespiegelte Zielmuster mit dem von der Mustersammeleinheit gesammelten hinteren Muster durch manuelle Beobachtung ausgerichtet ist,
wenn festgestellt wird, dass das gespiegelte Zielmuster nicht mit dem von der Mustersammeleinheit erfassten hinteren Muster übereinstimmt, das gespiegelte Zielmuster manuell durch manuelles Eingreifen angepasst wird, um jeden der Merkmalspunkte auf dem gespiegelten Zielmuster mit dem entsprechenden einen Merkmalspunkt auf dem von der Mustersammeleinheit erfassten hinteren Muster auszurichten.

9. Verfahren zum Durchführen eines doppelseitigen Tintenstrahldrucks auf einem Textil durch einen digitalen Tintenstrahldrucker nach Anspruch 6, wobei in Schritt a die Merkmalspunkte in einer Weise von einem Merkmalspunkt pro 6,4516 Quadratzentimeter (ein Merkmalspunkt pro Quadratzoll) an einer auszurichtenden Position bestimmt werden.

**Revendications**

1. Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante à jet d'encre numérique, dans lequel l'imprimante à jet d'encre numérique comprend :

    une tête d'impression à jet d'encre numérique (1) configurée pour effectuer une impression à jet d'encre sur la base d'un motif cible ;
    un système de contrôle (2) comprenant une unité de stockage (21), une unité de traitement (22) et une unité de contrôle (23), dans lequel l'unité de stockage (21) est configurée pour stocker des données, l'unité de traitement (22) est configurée pour recevoir, traiter et transmettre des données, et l'unité de contrôle (23) est configurée pour contrôler l'unité de traitement pour traiter les données et transmettre un signal d'impression ;
    une unité de collecte de motif (3) configurée pour collecter un motif sur le textile et
    transmettre le motif collecté à l'unité de stockage (21) du système de contrôle (2) ; et
    un dispositif d'alimentation en matériau (4) comprenant un support (41) et une courroie de guidage (42) disposée sur le support, dans lequel une région d'impression est disposée sur la courroie de guidage, et la tête d'impression à jet d'encre numérique (1) est disposée au-dessus de la région d'impression,
    dans lequel le procédé comprend :

        1) l'introduction d'un motif cible pour effectuer une impression à jet d'encre recto verso dans l'unité de stockage du système de contrôle ;
        2) la réalisation d'un processus de mise en miroir sur le motif cible pour obtenir un motif cible mis en miroir, et le stockage du motif cible mis en miroir dans l'unité de stockage ;
        3) la disposition du textile dans la région d'impression de la courroie de guidage, la transmission d'un signal d'impression à la tête d'impression à jet d'encre numérique par l'unité de contrôle, et l'impression du motif cible stocké sur une face avant du textile par la tête d'impression à jet d'encre numérique, pour former un motif imprimé avant,
        4) l'inversion du textile et la disposition du textile inversé sur la courroie de guidage, la collecte, par l'unité de collecte de motif, un motif arrière sur un côté arrière du textile qui est formé par perméation et est inversé en motif imprimé avant sur le côté avant du textile, et la transmission du motif arrière collecté à l'unité de stockage par l'unité de collecte de motif ;
        5) l'ajustement du motif cible mis en miroir obtenu à l'étape 2) par l'unité de traitement, pour aligner le motif cible mis en miroir avec le motif arrière collecté par l'unité de collecte de motif ; et
        6) l'impression du motif cible mis en miroir ajusté sur le côté arrière du textile par la tête d'impression à jet d'encre numérique,

    dans lequel, à l'étape 5), l'ajustement du motif cible mis en miroir par l'unité de traitement comprend :

a. la détermination d'une pluralité de points caractéristiques sur le motif cible mis en miroir ;
b. la reconnaissance, par l'unité de traitement et sur le motif arrière collecté par l'unité de collecte de motif, de points caractéristiques dont chacun est situé de manière à correspondre à l'un de la pluralité de points caractéristiques sur le motif cible mis en miroir, et le calcul d'un écart entre chacun des points caractéristiques obtenu à l'étape b et le point caractéristique correspondant obtenu à l'étape a ; et
c. l'ajustement, par l'unité de traitement, du motif cible mis en miroir sur la base de l'écart obtenu à l'étape b, pour aligner chacun des points caractéristiques sur le motif cible mis en miroir avec le point caractéristique correspondant sur le motif arrière collecté par l'unité de collecte de motif, pour aligner le motif cible mis en miroir avec le motif arrière collecté par l'unité de collecte de motif.

**2.** Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante numérique à jet d'encre selon la revendication 1, comprenant en outre : après l'étape 3), la réalisation d'un traitement à sec sur le textile.

**3.** Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante numérique à jet d'encre selon la revendication 1, dans lequel à l'étape a, avant de déterminer les points caractéristiques sur le motif cible mis en miroir, le motif cible mis en miroir est converti en un modèle en niveaux de gris.

**4.** Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante numérique à jet d'encre selon la revendication 1, dans lequel l'unité de collecte de motif (3) est un dispositif de numérisation ou une caméra.

**5.** Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante numérique à jet d'encre selon la revendication 1, dans lequel la courroie de guidage (42) est agencée avec un adhésif thermosensible ou un adhésif sensible à la pression, pour étaler le textile à plat sur la courroie de guidage (42).

**6.** Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante numérique à jet d'encre selon la revendication 1, dans lequel à l'étape a, les points caractéristiques sont déterminés à raison de 0,5 à 3 points caractéristiques par 6,4516 centimètres carrés (0,5 à 3 points caractéristiques par pouce carré) pour l'alignement et le positionnement, et aucun point caractéristique n'est déterminé au niveau d'une région d'une seule couleur sur le motif cible mis en miroir dans laquelle le motif cible mis en miroir ne présente aucun changement.

**7.** Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante à jet d'encre numérique selon la revendication 1, dans lequel l'imprimante à jet d'encre numérique comprend en outre une unité mobile (5) configurée pour être mobile dans une direction perpendiculaire à une direction d'alimentation de la courroie de guidage (42), et dans lequel
la tête d'impression à jet d'encre numérique (1) et l'unité de collecte de motif (3) sont disposées sur l'unité mobile (5), et l'unité de collecte de motif (3) est configurée pour se déplacer avec l'unité mobile (5) et collecter le motif arrière en temps réel.

**8.** Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante numérique à jet d'encre selon la revendication 1, dans lequel à l'étape c, dans le cas où l'écart pour aligner le motif cible mis en miroir avec le motif arrière collecté par l'unité de collecte de motif est supérieur à une valeur prédéfinie, il est déterminé si le motif cible mis en miroir est aligné avec le motif arrière collecté par l'unité de collecte de motif par observation manuelle,
s'il est déterminé que le motif cible mis en miroir n'est pas aligné avec le motif arrière collecté par l'unité de collecte de motif, le motif cible mis en miroir est ajusté manuellement par intervention manuelle, pour aligner chacun des points caractéristiques sur le motif cible mis en miroir avec le point caractéristique correspondant sur le motif arrière collecté par l'unité de collecte de motif.

**9.** Procédé pour effectuer une impression à jet d'encre recto verso sur un textile par une imprimante numérique à jet d'encre selon la revendication 6, dans lequel à l'étape a, les points caractéristiques sont déterminés à raison d'un point caractéristique par 6,4516 centimètres carrés (un point caractéristique par pouce carré) à une position devant être alignée.

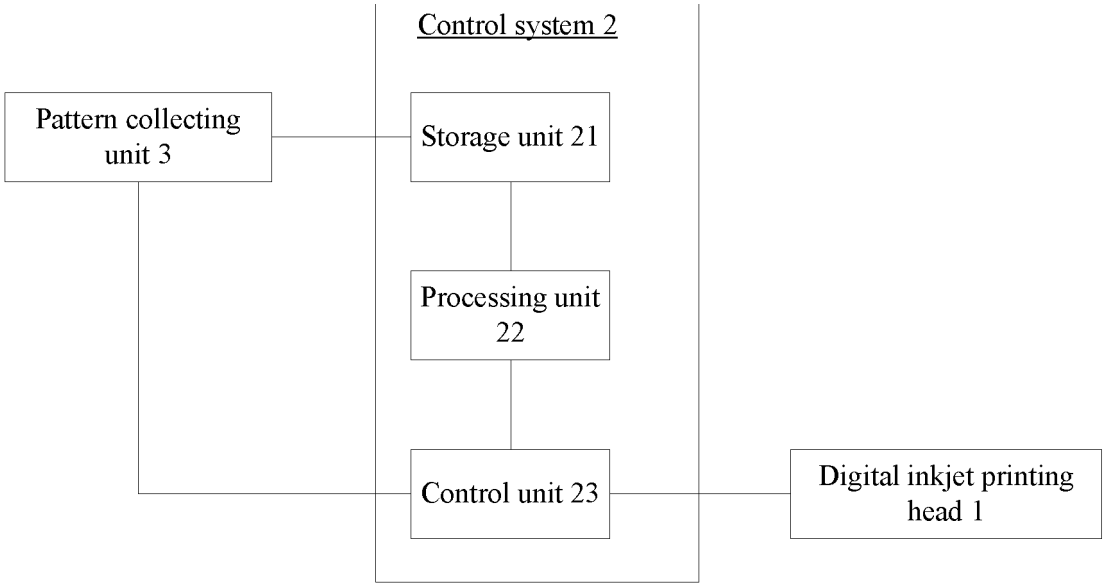


**Figure 1**

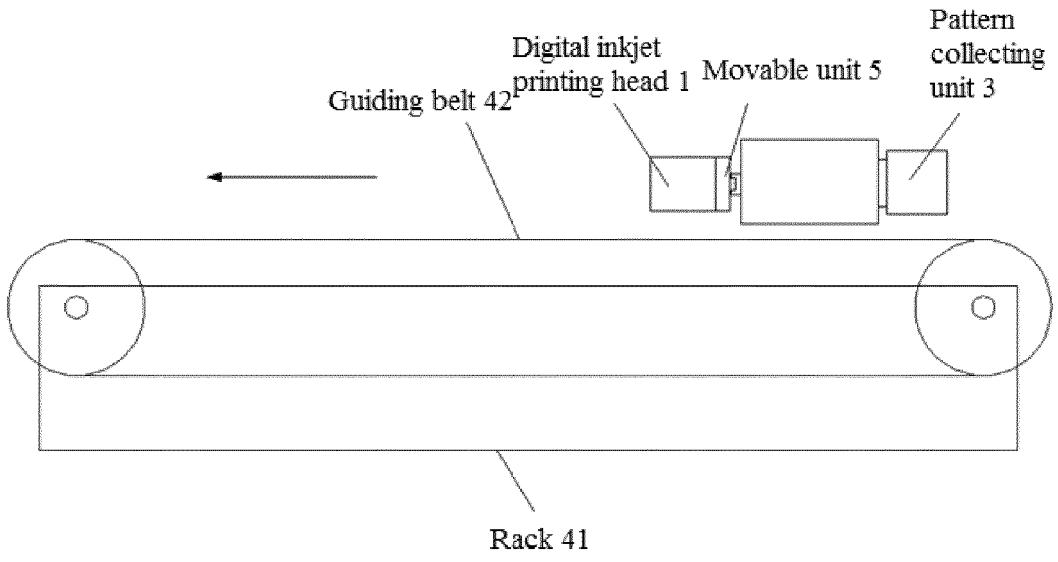


**Figure 2**

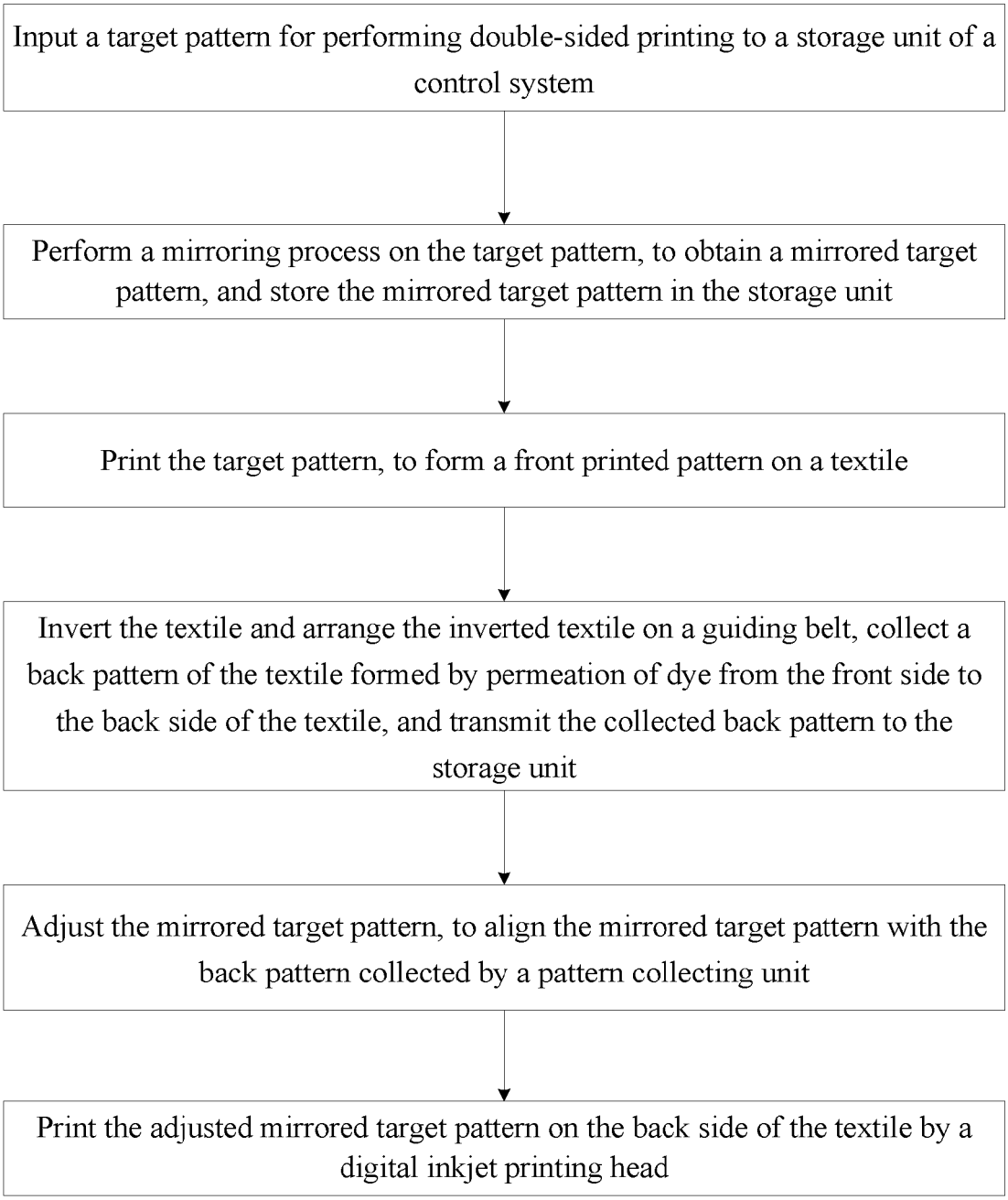
Input a target pattern for performing double-sided printing to a storage unit of a control system
Perform a mirroring process on the target pattern, to obtain a mirrored target pattern, and store the mirrored target pattern in the storage unit
Print the target pattern, to form a front printed pattern on a textile
Invert the textile and arrange the inverted textile on a guiding belt, collect a back pattern of the textile formed by permeation of dye from the front side to the back side of the textile, and transmit the collected back pattern to the storage unit
Adjust the mirrored target pattern, to align the mirrored target pattern with the back pattern collected by a pattern collecting unit
Print the adjusted mirrored target pattern on the back side of the textile by a digital inkjet printing head

**Figure 3**

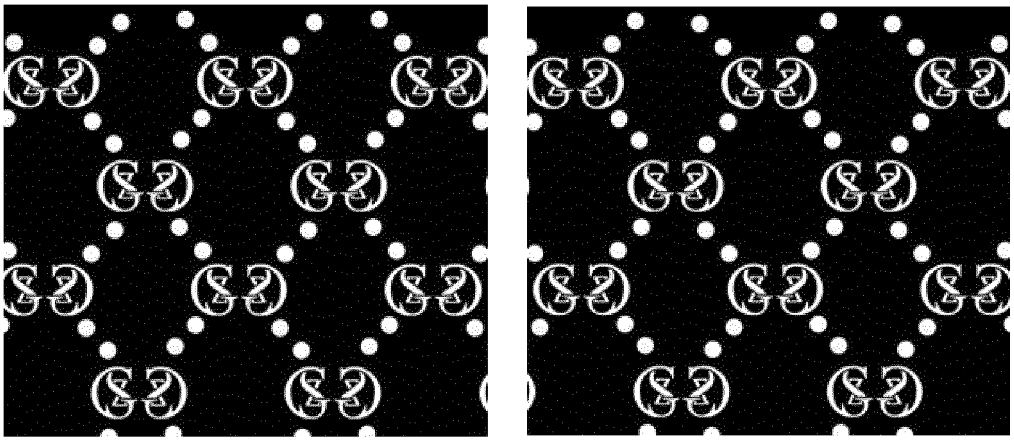

Figure 4

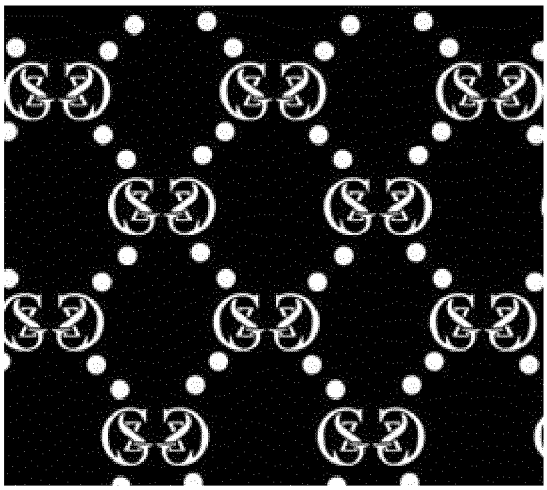

Figure 5

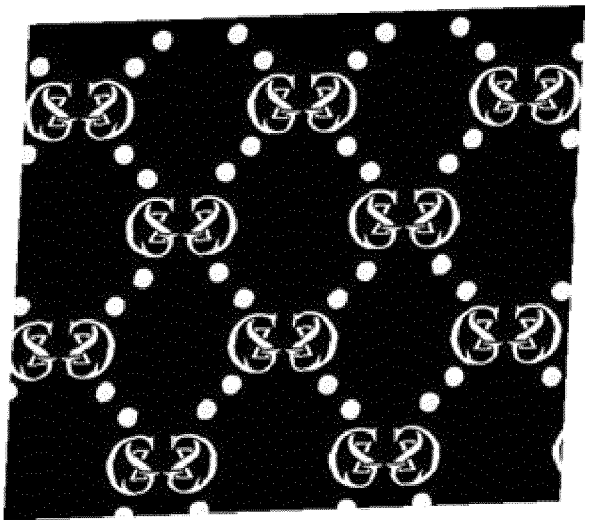

Figure 6

## REFERENCES CITED IN THE DESCRIPTION

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