



Screen printing method for flat textile structures and device for carrying out the method

Technical field

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The invention relates to a screen printing method for flat textile structures according to the preamble of claim 1 and to a device for carrying out the method according to the preamble of claim 6.

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Prior art

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The screen printing method is sufficiently well known. Using the screen printing method, different flat materials, for example paper, plastic, fabrics and the like, are printed. For screen printing, use is made of a printing cylinder which comprises a cylindrical screen or perforated cylinder with ink-permeable openings in the entire circumferential surface or in some regions of the circumferential surface and of a squeegee which is arranged within the screen.

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A printing cylinder of this type is disclosed in WO 9605058. Fig. 1 discloses a printing cylinder of this type in a printer arrangement having a pressure roll by means of which the flat structure to be printed is brought into contact with the screen. In this printer arrangement, the printing cylinder rotates continuously in the direction of the arrow X and the surface structure is moved in the direction of the arrow Y at the same linear speed as the circumferential speed of the screen. Using this arrangement, the flat structure is printed continuously with the same pattern formed on the screen cylinder. It is seen as disadvantageous that in each case a new printing cylinder has to be provided for the patterns to be printed. This results in greater expenditure in production and also in stockkeeping.

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When printing flat textile structures, printing is carried out with printing repeats, each printing repeat corresponding to one image. It is possible for
5 identical or different images to be printed at a distance from one another. In order to print an individual image, a section which is permeable to the printing medium and which is shorter than the length of the screen circumference, and a section which is
10 impermeable to the printing medium are arranged on the printing cylinder. In a manner analogous to this, a printing cylinder with different images has a corresponding number of sections permeable to the printing medium and sections impermeable to the
15 printing medium. In this mode, images are printed continuously at a distance onto the surface structure. As is known, this mode is used for printing labels.

During the printing of images with a printing cylinder, deficiencies can occur in the print and in the print
20 quality, which leads to waste and consequently to a low production output.

Summary of the invention

25 The invention is based on the object of improving a screen printing method and a device for carrying out the method.

30 The achievement of this object emerges from claims 1 and 6. Developments are the subject matter of the dependent claims 2 to 5 and 7 to 16.

The invention is based on the idea that, in order to
35 print a printing repeat, the flat textile structure is brought into operative connection with the printing cylinder at a printing position predetermined by the

printing cylinder and, after the printing repeat has been printed, is brought out of operative connection, and the printing of the flat structure is controlled by means of a stepwise forward and back movement of the flat structure.

The invention advantageously provides the possibility of setting the flat structure individually to the printing position predetermined by the printing cylinder. As a result, the distance between the images on the flat structure can be determined or changed. The flat structure can also be pulled to the printing position or beyond the printing position and the image can be printed again. This improves the print quality.

The invention further provides for it to be possible to use a stencil for printing. Using the stencil is essentially associated with the following advantages. Different images can be printed with the same cylinder. As a result of the replaceability of the stencil, the downtime can be shortened. The openings of the stencil can be produced online in the device by means of a thermal device or a laser device. These advantages lead to higher productivity and to extensive automation of the production.

Brief description of the drawings

Exemplary embodiments of the invention will be explained below using the drawings, in which:

- fig. 1 shows a known design of a screen printing device;
- fig. 2 shows a speed/time graph of a flat structure moved in accordance with the method of the invention;

- fig. 3A shows a view of a printout device according to the invention for carrying out the method;
- 5 fig. 3B shows a view of a modified design of the device according to fig. 3A;
- fig. 4 shows a view of a printing stencil;
- 10 fig. 5 shows a view of another design of the printer device with a printing stencil that can be changed automatically, and
- figs 6A/B show systems for changing the stencil
15 automatically.

Description of the preferred embodiments

The following description is based on printing textile
20 strips. Reference is made to fig. 2, which represents the sequence when printing a printing repeat. At the time T_0 , the textile strip is moved forward over the time interval A at a conveying speed synchronized with the circumferential speed V of the printing cylinder
25 and is in contact with the press surrender, so that it is printed. The printing operation is completed shortly before the time T_1 is reached. From the time T_1 on, the textile strip is braked with a constant braking force during the time interval B, so that the
30 conveying speed decreases linearly and reaches a standstill at the time T_2 . From the time T_2 on, the textile strip is moved rearward. At the time T_2 the textile strip is accelerated during the time interval C and, at the time T_3 , reaches a constant conveying
35 speed, which is maintained during the time interval D until the time T_4 . From the time T_4 on, the textile strip is braked during the time interval E until the

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time T5. From the time T5 on, the textile strip is again moved forward, the textile strip being accelerated to the conveying speed synchronized with the circumferential speed of the pressure cylinder during the time interval F until the time T0. At the time T0 a new printing interval begins during the time interval A, that is to say the sequence is repeated.

As fig. 3A shows, a device for printing a textile strip 1 comprises a printing cylinder 2, a squeegee 3 arranged in the printing cylinder 2 for inking the printing cylinder, and a conveying device 4 for the textile strip. The printing cylinder 1 is formed as a hollow cylinder and has a wall section 6 that is permeable to a printing medium and a section 7 that is impermeable to the printing medium. The printing cylinder 2 can consist of a suitable material, for example of metal, plastic or the like. The squeegee 3 is arranged to be stationary in the printing cylinder 2. The conveying device 4 is formed as a roller arrangement and comprises two pairs of rollers 11 and 12 each having a transport roller 13 and 14 for conveying the textile strip 1, a pressure roller 15 for pressing the textile strip 1 against the transport roller and also a pressure roller 16 for pressing the textile strip 1 against the printing cylinder 2. The conveying device 4 has a driving device with two reversible drive motors 17, which are coupled to the transport rollers 13 and 14 in order to move the textile strip 1 forward in the direction of arrow I and rearward in the direction of arrow II. The drive motor used is a stepping motor or a servo motor. The pressure roller 16 is freely rotatably arranged and is mounted in means, not illustrated, in order to lift the pressure roller off the printing cylinder or to press it onto the printing cylinder.

Arranged on the circumference of the printing cylinder 2 is a printing stencil 21. The printing cylinder is provided with means 22 for clamping the printing stencil firmly, so that the printing stencil 21 can be
5 fixed to the printing cylinder 2 and replaced manually.

The device according to fig. 3B differs from the device according to fig. 3A in that two inking rolls 32 and 33 for inking the printing cylinder 2 are provided.

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Fig. 4 shows an example of a printing stencil. The printing stencil 21 consists of material which is impermeable to the printing medium and is provided with through-holes 25 for the printing medium which
15 represent a pattern 26 to be printed. The printing stencil 21 can consist of plastic in such a way that the through holes can be produced by means of a thermal printhead or a laser device.

20 The device according to fig. 5 differs from that of fig. 3A in that the printing stencil 21 can be replaced automatically. In order to replace the printing stencil 21, an element 31 is provided which, with respect to the printing cylinder, is arranged such that
25 it can be moved in the direction of the double arrow III.

The automatic change will be explained using figs 6A and 6B. Fig. 6A illustrates schematically the system
30 for fitting the printing stencil and fig. 6B illustrates schematically the system for removing the printing stencil. For this purpose, a clamping element 41 which can be released and closed automatically is provided on the printing cylinder 2.

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The fitting system comprises a supply roll 42 of strip material 43 for the stencil, a thermal printhead or a

digitally controlled laser device 44 and two conveyor rollers 45, 46. In order to fit a printing stencil 21, the printing cylinder is set in such a way that, with the clamping element 41 open, the free end of the strip material can be inserted underneath the open clamping element. The clamping element 41 is then closed. As a result of the rotation of the printing cylinder in the counterclockwise direction X, the strip material 43 is pulled off the supply roll 42, provided by the printhead 44 with openings 25 for the printing medium and wound onto the printing cylinder. Once the strip length necessary for the printing stencil has been pulled off and the stencil has been provided with openings, the strip material is cut off by means of a cutting device, not illustrated. Fig. 6B shows the printing stencil 21 fitted in this way, the free end of the latter projecting from the printing cylinder in order to make it easier to remove the printing stencil. The printing stencil is lifted off the printing cylinder 2 by an element 31, which is arranged in such a way that it can move in the direction of the arrow III. The element is part of a mechanism which includes a wheel 48 for pulling off the lifted printing stencil 21 and a cylinder 49 for holding the printing stencil. In order to lift the printing stencil, the element 31 is moved in the direction of the printing cylinder in such a way that the element 31 grips the free end of the printing stencil. The printing cylinder is then rotated in the clockwise direction X1. As a result, the printing stencil is lifted off the printing cylinder and the clamping element 41 is opened.

A rotary screen printing method for flat textile structures, in particular textile strips, is disclosed. In this method, at least one image represented as a printing repeat is printed onto the flat structure 1 by means of a continuously rotating printing cylinder 2

having at least one circumferential section in the circumferential surface which is permeable to printing medium. In order to print a printing repeat in the circumferential direction, the flat textile structure 1
5 is moved to a printing position determined by the printing cylinder, furthermore brought into operative connection with the printing cylinder 2 and, following printing, brought out of operative connection. For this purpose, the flat textile structure 1 is moved
10 forward and back stepwise for each printing repeat.

A device for carrying out the method contains a conveying device 4 with a reversible drive device 11 for setting the flat structure to the printing position
15 by means of stepwise forward and back movement.

Designations

A	Time interval
B	Time interval
C	Time interval
D	Time interval
E	Time interval
F	Time interval
T	Time
V	Speed
X	Direction of rotation of printing cylinder
Y	Direction of movement of strip
1	Textile strip
2	Printing cylinder
3	Squeegee
4	Conveying device
6	Wall section
7	Section
11	Pair of rollers
12	Pair of rollers
13	Transport roller
14	Transport roller
15	Pressure roller
16	Pressure roller
21	Printing stencil
22	Firm clamping means
25	Opening
26	Pattern
31	Element for the replacement
32	Inking roll
33	Inking roll
41	Clamping element
42	Supply roll
43	Strip material
44	Printhead
45	Conveyor roller
46	Conveyor roller
48	Wheel

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49 Cylinder

Patent claims

1. A screen printing method for flat textile structures, in particular textile strips (1), in which at least one image represented as a printing repeat is printed on the flat structure (1) by means of a continuously rotating printing cylinder (2) having at least one circumferential section in the circumferential surface that is permeable to a printing medium, characterized in that, in order to print a printing repeat in the circumferential direction, the flat textile structure (1) is moved to a printing position determined by the printing cylinder, brought into operative connection with the printing cylinder (2) and, after printing, is brought out of operative connection, and in that the flat textile structure (1) is moved forward and back stepwise for each printing repeat.
2. The method as claimed in claim 1, characterized in that the flat structure (1) is moved back into the printing position predetermined by the printing cylinder.
3. The method as claimed in claim 1, characterized in that the rearward guidance of the flat structure (1) comprises the following steps: stopping the flat structure; pulling the flat structure back; stopping the rearward movement; accelerating the flat structure to the circumferential speed of the printing cylinder (2); laying the flat structure on the printing cylinder when the printing position is reached.
4. The method as claimed in claim 3, characterized in that the flat structure (1) is moved beyond the printing position during the rearward movement.

5. The method as claimed in claim 1, characterized in that a printing stencil is used.
6. A device for carrying out the method, having a
5 printing cylinder (2) with at least one circumferential section that is permeable to a printing medium, having a device (3; 32, 33) arranged in the printing cylinder for inking the printing cylinder, and having a conveying device
10 (4) for the flat structure (1), as claimed in one of the preceding claims, characterized in that the printing position is determined by the circumferential section that is permeable to the printing medium, and in that the conveying device
15 (4) has a reversible drive device (11, 12; 17) for setting the flat structure to the printing position.
7. The device as claimed in claim 6, characterized in
20 that the printing cylinder (2) consists of metal or plastic.
8. The device as claimed in claim 6, characterized in
25 that the device (3) for inking the printing cylinder (2) is a squeegee.
9. The device as claimed in claim 6, characterized in
30 that the device (32, 33) for inking the printing cylinder (2) is an inking unit.
10. The device as claimed in claim 6, characterized in
that the conveying device (4) is formed as a roller arrangement.
- 35 11. The device as claimed in claim 6, characterized in that at least one printing stencil (21) is

arranged on the section of the printing cylinder (2) that is permeable to the printing medium.

- 5 12. The device as claimed in claim 11, characterized in that a plurality of printing stencils (21) are arranged beside one another.
- 10 13. The device as claimed in claim 10 or 11, characterized in that the printing stencil (21) consists of plastic.
- 15 14. The device as claimed in claim 11, characterized in that the printing stencil (21) is arranged on the printing cylinder (2) such that it can be replaced manually or automatically.
- 20 15. The device as claimed in claim 11, characterized in that the printing stencil (21) is produced online in a digital manner.
16. The device as claimed in claim 11, characterized in that the printing stencil (21) is produced by means of a digitally controlled thermal or laser device.