United States Patent

Zimmer

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[54] DEVICE FOR APPLYING A LIQUID AGENT TO A FLAT MATERIAL

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **68/200,** 118/261, 118/262, 118/DIG. 4

[51] **Int. Cl.** **B05c 5/00**

[58] **Field of Search** ..... 68/200, 202, 204, 205 R; 118/DIG. 4, 261, 262

[56] **References Cited**

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[57] **ABSTRACT**

An improved device for applying a liquid agent such as dye in the form of a thin film to and more uniformly across the whole breadth of a flat sheet material, such as textile fabrics, which material is moved relatively past and separated from the applying device. The novel applying device includes a rotary screen cylinder positioned above the sheet material and having an internally disposed pressure or stow squeegee acting on the inner wall thereof in cooperation with an externally disposed doctor or counterpressure squeegee engaging the outer surface thereof and preferably with the squeegees arranged perpendicularly below the axis of the rotary screen. The opposed squeegees may be cylindrical or generally flat or combinations of both and preferably are magnetically attracted to one another through the rotary screen. Another form utilizes a further cylindrical roller disposed parallel to a cylindrical external doctor squeegee and placed below the surface of the sheet material to which the liquid agent is applied. In this latter form, both of said rollers rotatively work together in a common rotative direction, with said doctor squeegee rolling in a counterdirection to a depending flow of the liquid agent issuing from the rotary screen adjacent to the external doctor roller.

5 Claims, 6 Drawing Figures

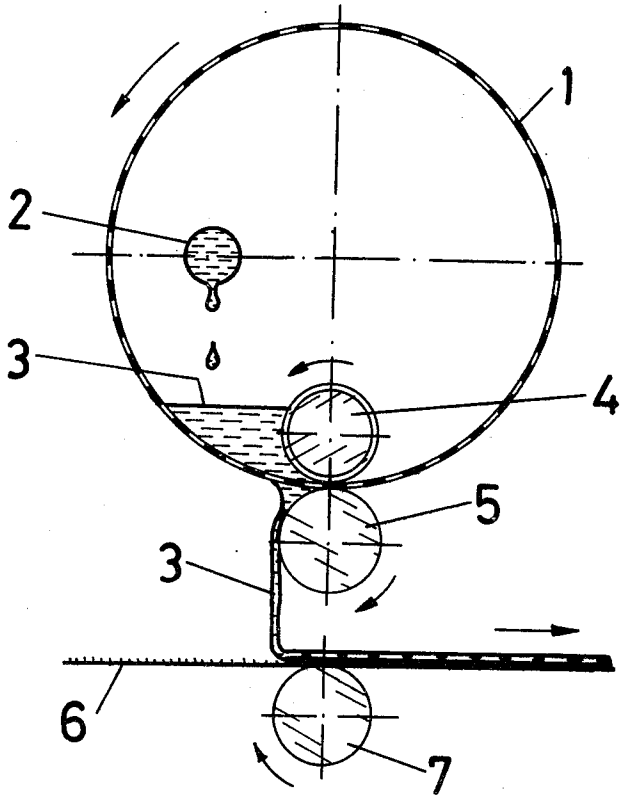

Fig. 1

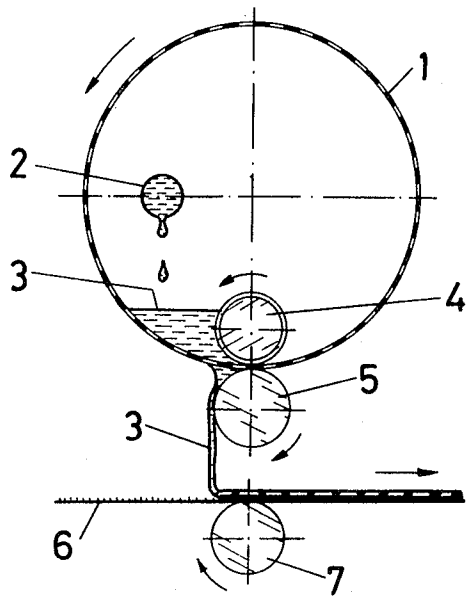

Fig. 2

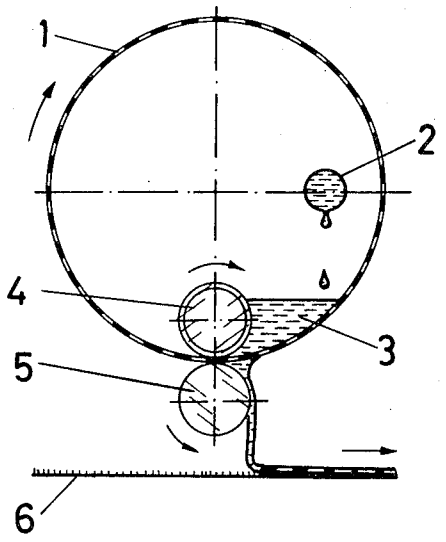

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Fig. 3

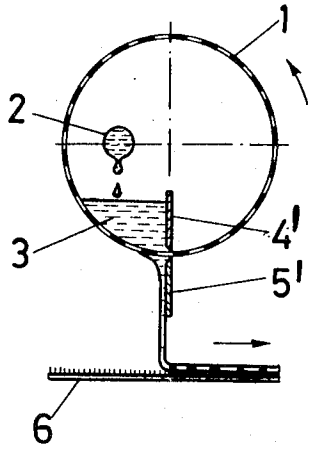


Fig. 4

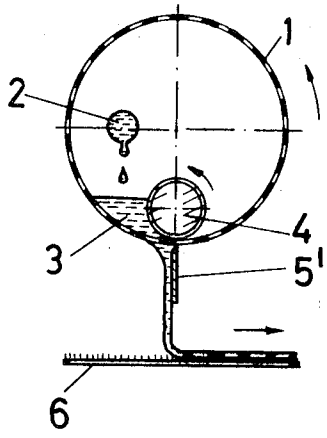


Fig. 5

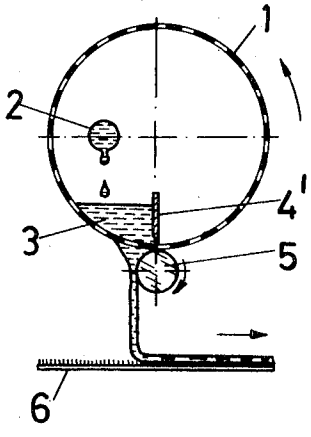
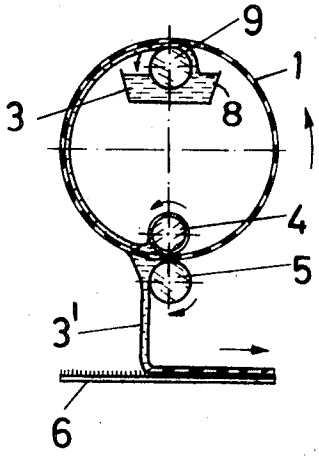


Fig. 6



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DEVICE FOR APPLYING A LIQUID AGENT TO A FLAT MATERIAL

This invention relates to a device for applying a liquid agent to a flat material, particularly to a textile fabric, said liquid agent being applied to the surface of said material in the form of a film by means of an applying device, said material being moved relatively to said applying device.

When dyeing textile material (also simply called a fabric), the fabric is treated in a dye liquor according to known methods. According to the exhaust process the fabric is drawn through the dye liquor in rope form or in a spreadout state. In pad dyeing the fabric soaked in dye liquor is passed between squeeze rollers which press the dye liquor into the fabric. The known dyeing methods show certain disadvantages. Thus the quantity and loss of dye liquor is relatively remarkable in the exhaust process. Moreover, the control of color intensity is extremely difficult and finally, dyeing in the exhaust process takes place relatively slowly so that only a small achievement can be performed. The disadvantage of pad dyeing is, above all, that high pressure must be between the squeeze rollers, which may, for example in the case of pile fabrics, affect the fabric quality adversely. In pad dyeing squeeze rollers often deflect, which puts into question the dyeing uniformity. Finally, in pad dyeing the control of color intensity is also difficult and possible on a limited scale only.

Another dyeing process is known, however, particularly for pile fabrics, in which the fabric is not passed through the dye liquor, but the dye liquor is applied to the fabric surface in the form of a film. In connection with this method an applying device has got known according to which a transport roller rotates in a dye pan; a dye film is taken off said transport roller by means of a doctor blade, said dye film then flowing over the inclined doctor blade to the fabric passing freely under the doctor blade. Though this permits quite a good control of the dye liquor applied, it does not ensure a uniform dyeing over the whole breadth of the fabric, as the dye film applied to the dye transport roller is subject to variations.

This shortcoming is ruled out according to the invention in that the applying device consists of a rotatable screen cylinder arranged at a distance above the fabric to be treated; at least one pressure and stow squeegee act on the inwall of said screen cylinder, while at least one counterpressure or doctor squeegee is opposed at the outside of the screen cylinder.

By means of the applying device of the invention a uniform dye film can be produced over the whole breadth of the fabric to be treated and applied to the fabric. A control of the dye intensity may also be achieved without difficulties, i.e., simply through controlling the rate of revolution of the screen cylinder and the transport speed of the fabric.

The use of the applying device according to the invention is not only restricted to applying dye liquor; it can be expanded to applying other liquors, for example pastes or finishing stuff; thus it may be conveniently applied in lining and finishing machines.

For a better understanding of the invention reference may be made to the accompanying drawings, in which

FIGS. 1 to 6 are diagrammatic sectional views of various applying devices according to the invention and of part of the fabric to be treated.

In the embodiment according to FIG. 1 the applying device consists of a screen cylinder into which projects a supply tube 2 for the liquid agent 3 to be applied, for example the dye liquor. A cylindrical pressure and stow squeegee 4 acts on the inwall of the screen cylinder 1, an equally cylindrical counterpressure and doctor squeegee 5 on the opposite outside of the screen cylinder 1. Both the cylindrical squeegees 4 and 5 are pressed against each other, for example by magnetic forces; for this purpose one of both cylindrical squeegees 4 and 5 consists, for example, of a magnet body or contains such a magnet body, while at least part of the other consists of magnetizable material.

When the screen cylinder 1 rotates in direction of the arrow, the cylindrical squeegees 4 and 5 roll off the inside or

outside of the screen cylinder 1. The liquid agent 3 is thus pressed through the openings of the screen cylinder 1 by means of the pressure and stow squeegee 4 and, in the form of the film 3', flows over the counterpressure and doctor squeegee 5 onto the fabric 6 advancing in direction of the arrow. The fabric 6 is a pile fabric, as the applying device of the invention is particularly appropriate for dyeing pile fabrics.

The rate of revolution of the screen cylinder 1 and the transport speed of the fabric 6 may be adjusted. This permits a simple control of the dye liquor intensity on the fabric 6.

The means for driving the fabric 6 and that for driving the screen cylinder 1 can be coupled, preferably over an infinitely adjustable transmission, whereby the circumferential speed of the screen cylinder 1 relative to the transport speed of the fabric is infinitely adjustable.

The screen cylinder 1 together with both the cylindrical squeegees 4 and 5 may be adjustable transversely to the plane of the fabric 6, so that the cylindrical squeegee 5 is at a distance from the fabric or touches the fabric 6, exerting a pressure on the latter or on the film of the liquid agent applied. If, in the latter case, a further roller 7 is arranged below the fabric 6, both the rollers 5 and 7 act together like in pad dyeing.

Due to their pressure onto each other, both the cylindrical squeegees 4 and 5 also cause a packing in view of the inner and outer walls of the screen cylinder, so that the applied liquid agent 3 cannot get behind the squeegee 4 or 5.

The embodiment according to FIG. 2 differs from that in FIG. 1 only in the direction of rotation of the screen cylinder 1 and in the cylindrical squeegees 4 and 5 as well as in the position of the supply tube 2 for the liquid agent 3.

In the embodiment according to FIG. 3 a bladelike pressure and stow squeegee is arranged in the screen cylinder and an equally bladelike counterpressure and doctor squeegee 5 at the outside.

The embodiment according to FIG. 4 illustrates the case in which the pressure and stow squeegee 4 inside the screen cylinder 1 is cylindrical and the counterpressure and doctor squeegee 5' at the outside of the screen cylinder 1 is bladelike.

In the embodiment according to FIG. 5, however, the pressure and stow squeegee 4' inside the screen cylinder 1 is bladelike and the counterpressure and doctor squeegee at the outside is cylindrical.

While in the embodiment according to FIGS. 1 to 5 the liquid agent 3 is supplied inside the screen cylinder by a supply tube 2, a pan 8 is arranged inside the screen cylinder in the embodiment according to FIG. 6, the liquid agent 3 being applied from said pan 8 to the inside of the screen cylinder by means of a transport roller 9. Due to the rotation of the screen cylinder 1, the liquid agent is applied to the inwall before it gets to the pressure and stow squeegee 4, where it then is pressed by the latter through the screen openings of the screen cylinder 1 and flows as film 3' over the counterpressure and doctor squeegee 5 onto the fabric 6.

In all embodiments a pair of opposite cylindrical or bladelike squeegees is represented which are arranged perpendicularly below the axis of the screen cylinder. This is the normal case. The pair of squeegees need not necessarily be arranged perpendicularly below the axis of the screen cylinder. Moreover, a plurality of squeegee pairs may be arranged in the lower half of the screen cylinder; thereby it is again convenient to arrange one of the squeegee pairs perpendicularly below the axis of the screen cylinder. Thus several films or layers of the liquid agent can be applied from one screen cylinder to the fabric to be treated.

What I claim is:

1. A device for applying a liquid agent onto a flat material, especially to a textile fabric, said liquid agent being applied to the surface of said material in the form of a film by means of an applying device, said material being moved relatively to said applying device, said applying device consisting of a rotatable screen cylinder arranged at a distance above the material to be treated, at least one pressure and stow squeegee

acting on the inwall of said screen cylinder, at least one counterpressure or doctor squeegee being opposed to said pressure and stow squeegee at the outside of said screen cylinder.

2. A device as claimed in claim 1, wherein at least one of the squeegees is cylindrical.

3. A device as claimed in claim 1, wherein the inside pressure and stow squeegees and the pertinent outside squeegees are magnetically pressed against each other.

4. A device as claimed in claim 1, wherein a further roller is arranged below the material to be treated and below the cylindrical counterpressure and doctor squeegee acting on the outside of the screen cylinder.

5. A device as claimed in claim 1, wherein the pressure and stow squeegee as well as the counterpressure and doctor squeegee are arranged perpendicularly below the axis of said screen cylinder.

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