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**A METHOD OF AND APPARATUS FOR IMPREGNATING A
TEXTILE WEB WITH AN IMPERMEABLE MEDIUM.**

THIS INVENTION relates to a method of and apparatus for impregnating a textile web with an impermeable medium in accordance with a predetermined pattern. This method forms part of a wax printing technique in which the impregnated medium, usually in the form of a naturally occurring resin, is liquefied by raising its temperature and then applied to the textile web in accordance with the pre-selected pattern and thereafter solidified by cooling.

After solidification of the resin the non-impregnated portions of the web which jointly form a complementary pattern are coloured by means of a medium such as ink or dye. It is necessary in wax printing to apply the impermeable resin to both faces of the web and a conventional apparatus for carrying out the process is described in British patent No. 1419707 in which an apparatus includes an impregnating station to which the textile web is fed from a supply roll and carried through a nip between a first support roll and an impregnating roll such that one face of the web is impregnated with the resin, and subsequently through a nip between a further support roll and impregnating roll acting upon the opposite face of the web. Travelling between the web and each support roll is a moistened blanket which initiates the cooling of the resin as it passes through the web and ensures that the web will not adhere to the support roll. The two impregnating rolls are spaced apart in the direction of travel of the web so that the two opposed faces of the web are not

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impregnated simultaneously.

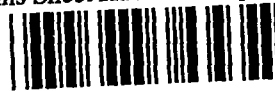
Traditionally, apparatus of this kind has involved the use of copper rollers as the impregnating rolls which are inherently expensive to replace when worn.

According to the present invention, there is provided a method of impregnating a textile web with an impermeable medium according to a predetermined pattern, comprising the steps of feeding the web through a nip between two impregnating rolls each carrying the predetermined pattern and positioned on the two opposed faces of the web, feeding the impermeable medium in liquefied form simultaneously from the rolls onto both faces of the web, and then solidifying the impregnating medium after application to the textile web, by cooling.

Also according to the present invention, there is provided apparatus for impregnating a textile web with an impermeable medium, comprising a pair of impregnating rolls each carrying a predetermined pattern and arranged to form a nip through which the textile web is passed, means for feeding liquefied impermeable impregnating medium simultaneously from the rolls onto both faces of the web, and means for cooling the web after application of the impregnating medium.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings

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in which:-

Fig. 1 is a diagrammatic side elevation of an apparatus made in accordance with one aspect of the invention;

Fig. 2 is a view of an impregnating roll and support mechanism;

Fig. 3 is a cross-sectional view of an impregnating station being part of the apparatus of Fig. 1;

Fig. 4 is a cross-sectional view of an impregnating roll in the form of a screen, with a doctor blade and adjusting mechanism;

and Fig. 5 is a perspective exploded view of an impregnating screen having a squeegee device and heater.

Referring now to Fig. 1 the apparatus comprises a frame having a simple construction of vertical columns 1 and horizontal beam 2. The columns 1 extend vertically upwards from a base 3. A supply roll 4 carries a textile web 5 in a rolled condition. The web 5 is guided to an impregnating station 6 by a pressure roller 7 and a series of guide rollers 8, and positioning guides 9 which are adjustable and automatically determine the lateral position of the web 5.

In the impregnating station 6 impregnation takes place simultaneously on both opposed faces of the web 5. The web passes



through a nip between a pair of impregnating screens 28 which are set identically in mirror image form on both sides of the textile web 5 i.e. both screens carry an identical predetermined pattern in which impermeable resin is to be applied to the two surfaces of the web simultaneously. Each screen 28 is similar to a rotary printing screen comprising a mesh surface, usually of stainless steel, through which the impregnating resin is passed in a radially outwards direction thus to be applied to the adjacent surface of the web 5 according to a required pattern provided on the surface of the screen.

Immediately following the nip between the impregnating screens 28 is a water spray 10 to provide initial cooling of the impregnating resin after it leaves the nip. In the base 3 there is provided a water bath 13 having a pair of submerged rollers 11 and 12 arranged to form a nip through which the web 5 passes after leaving the impregnating station. The rollers 11 and 12 also serve to guide the web so that it always maintains exactly a tangent to the two surfaces of the impregnating screens 28. For this purpose the position of the roller pair 11 and 12 may be adjusted.

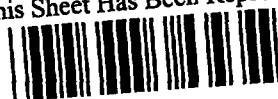
After passage through the water bath 13 the textile web and the impregnated resin thereon are completely cooled and the web is guided onwards to a take-up roll 16 via pressure rollers 14 and a series of guides 15. Finally, the web 5 is guided to a delivery station 17 and then deposited onto a removal truck 18.

Preferably, the pressure roller 7, impregnating screens 28

and pressure roller 14 are all driven simultaneously and in synchronism by a single electric drive motor with the aid of a PIV reduction gear box such that the speeds are synchronised to avoid excessive tension or timing of the web during the impregnation process. Referring to Figs. 3 and 4, prior to impregnation of the web it is necessary to adjust the impregnating screens to ensure that they are in register, one with the other, so that the complimentary patterns are matched, and to ensure that the nip is appropriate for the thickness of the web 5. This can be done manually by hand wheels 39 and adjusting screws 37. Each screen is pivotally mounted on a cradle 38. Each such assembly is fitted with pneumatic cylinders to enable the screen to be retracted thus to be clear of the textile web once impregnation has ceased. A gear 36 which drives each impregnating screen is in turn driven by a helical gear 35 connected to the driven shaft of the main drive motor.

Within each impregnating screen 28 a doctor blade 34 and squeegee mechanism 20 are manually adjustable by means of a pair of hand wheels such that the angle of the doctor blades 34 may be set to give optimum flow of resin from outlets 41 spaced apart along squeegee 20, onto the blade 34 and outwardly to the inner surface of the screen 28. A steam heated jacket 42 surrounds a resin supply tube 43 to keep the resin at the required temperature so that it will flow. Whereas all positioning adjustments are effected manually, the initial movement to bring the squeegee blade into close proximity with the inner surface of the impregnating screen 28 is effected pneumatically.

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The supply of impregnating medium to the screens 28 is pneumatically controlled with the aid of a probe attached within each screen 28 and comprises a device which maintains the level of medium inside the impregnating screen during the process. This level may be adjusted manually.

The temperature of the impregnating medium (wax rosin) must be maintained until it reaches the impregnating screen, and this is ensured by installing thermostatically controlled infra-red heaters 19 which cover the screen as illustrated in Fig. 5.

A method and apparatus in accordance with the invention differs from the prior art in several respects. For example, the present apparatus avoids the use of copper rollers. Whilst it is possible that the rotary mesh screens 28 may have a shorter working life when compared with conventional copper rollers, they are nevertheless considerable less expensive to replace and much lighter in weight. It is also more convenient and less costly to apply the pre-selected pattern to the screen surfaces when compared with the engraving process conventionally employed for copper rollers. Also, the changeover time for new patterns is substantially reduced thus improving productivity. Because both screens provide a nip through which the web passes to be impregnated simultaneously on both sides thereof, no support rollers are required and thus no backing blankets. The impregnating station occupies less height since the axes of the impregnating rolls are in a common plane. Both faces of the web are impregnated simultaneously and the web travels vertically downwards

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in a straight line. The impregnating medium is passed through the mesh screens from inside the latter using a squeegee mechanism thus avoiding the need for liquid baths and transfer rollers, and the impregnating medium is continuously circulated.

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CLAIMS

1. A method of impregnating a textile web with an impermeable medium according to a predetermined pattern, comprising the steps of feeding the web through a nip between two impregnating rolls each carrying the predetermined pattern and positioned on the two opposed faces of the web, feeding the impermeable medium in liquefied form simultaneously from the rolls onto both faces of the web, and then solidifying the impregnating medium after application to the textile web, by cooling.
2. A method according to Claim 1, wherein the textile web is fed to the nip between the two impregnating rolls by means which automatically determine the lateral position of the web.
3. A method according to any preceding claim, wherein the textile web is fed to and from the nip between the impregnating rolls in a vertically downwards direction.
4. A method according to any preceding claim, wherein the textile web, after passing through the nip, is initially cooled by a water spray.
5. A method according to any preceding claim, including the step of heating the impregnating medium to a temperature which will enable it to flow readily onto the textile web.





6. A method according to any preceding claim, wherein the impregnating rolls are provided with mesh contact surfaces through which the impregnating medium is transferred onto the textile web.
7. Apparatus for impregnating a textile web with an impermeable medium, comprising a pair of impregnating rolls each carrying a predetermined pattern and arranged to form a nip through which the textile web is passed, means for feeding liquefied impermeable impregnating medium simultaneously from the rolls onto both faces of the web, and means for cooling the web after application of the impregnating medium.
8. Apparatus according to Claim 7, including means for guiding and determining the lateral position of the web as it is fed to the nip between the impregnating rolls.
9. Apparatus according to Claim 7 or Claim 8, including a bath adapted to contain cooling liquid, disposed vertically beneath the impregnating rolls and guide means carrying the web from the nip into the bath in a vertical straight line, said means being adjustable to ensure straight vertical passage of the web.
10. Apparatus according to any one of Claims 7 to 9, including a water spray to provide initial cooling of the impregnating resin after the web leaves the nip.
11. Apparatus according to any one of Claims 7 to 10,





wherein each said impregnating roll is a rotary mesh screen through which the impregnating medium may pass in a radially outwards direction to be applied to the adjacent surface of the web passing through the nip, said mesh carrying the a predetermined pattern.

12. Apparatus according to Claim 11, including means for maintaining a substantially uniform flow rate of said medium outwardly through the mesh screen.

13. Apparatus according to Claim 11 or 12, including means on or within said mesh screen to maintain the medium at or close to a predetermined temperature sufficient to enable the medium to flow.

14. Apparatus according to any one of Claims 7 to 13, wherein the impregnating rolls are driven simultaneously and in synchronism by a single electric drive motor.

15. Apparatus according to any one of Claims 7 to 14, including means to adjust the relative positions of said impregnating rolls to ensure that they are in register, one with the other, so that the complementary patterns thereon are matched and to ensure that the nip is appropriate for the textile web.

16. Apparatus according to any one of Claims 7 to 15, including means to enable the impregnating rolls to be retracted out of contact with the textile web.

17. Apparatus according to any one of Claims 11 to 13,



including a squeegee mechanism to force the impregnating medium outwardly through the mesh screens from inside the latter, and means continuously to circulate the medium before passage through the screens.

18. A method of impregnating a textile web with an impermeable medium according to a predetermined pattern, substantially as hereinbefore described, with reference to the accompanying drawings.

19. Apparatus for impregnating a textile web with an impermeable medium, substantially as hereinbefore described, with reference to and as illustrated in the accompanying drawings.

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