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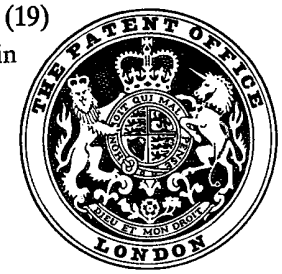

(54) PROCESS FOR THE TREATMENT OF PAPER

(71) We, ROHM G.m.b.H., a German Body Corporate of Darmstadt, Germany, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a process for impregnating strips of absorbent untreated paper with solutions or dispersions of synthetic resins.

Absorbent untreated paper has hitherto been impregnated for example by passing it through a solution or aqueous dispersion of the impregnating agent, squeezing out the excess liquid between rollers, drying the paper and hardening it. The step which determines the speed of this process is the saturation of the strip of paper with the synthetic resin solution or dispersion. The paper fibres have to be wetted and the air in the pores has to be expelled. Since the air escapes only with difficulty as long as the paper is immersed in the synthetic resin solution or dispersion, the strip must be passed through the impregnating bath and then through the air several times in extended loops.

It has also been proposed to apply the impregnating agent to the surface of the strip of paper and optionally afterwards to pass the strip through a soaking bath after the agent applied initially has penetrated into the paper. However the impregnating process cannot be significantly speeded up by this means.

It is an object of the present invention to provide a new and advantageous process for the impregnation of paper with aqueous dispersons or solutions of synthetic resins.

According to the present invention we provide a process for the continuous impregnation of a strip of absorbent paper with a solution or dispersion of a synthetic resin which comprises applying the said solution or dispersion onto one side of the said strip of paper in an amount sufficient for saturation of the strip, and subsequently passing the strip through a suction zone in which suction is applied to the opposite side of the strip whereby the solution or dispersion is drawn into the strip by suction.

The said solution or dispersion is preferably aqueous.

After being passed through the suction zone to effect complete saturation the strip of paper may be subsequently dried and, if the resin contains cross-linkable groups, hardened.

We have found that strips of absorbent untreated paper can be impregnated with aqueous solutions or dispersions of impregnating resins in accordance with the invention at high speed and in a short time up to saturation point.

The processes of wetting and penetration of the paper by the impregnating liquid, expulsion of the air and total saturation, which occur only slowly on their own, are greatly accelerated by the use of suction; with the result that the operational speed is substantially determined by the capacity of the drying and hardening zone.

The present invention is particularly applicable to the impregnation of unsized or only slightly sized untreated paper with high absorbency. The paper may be dyed or printed right through or only superficially. The weight per unit area of the paper is preferably between 40 and 300 g/m^2.

Materials which may be used to impregnate the paper include dispersions of polyacrylate or polymethacrylate esters, polyvinyl acetate or polyvinyl chloride and solutions of phenol-formaldehyde, urea-formaldehyde or melamine-formaldehyde precondensates as well as compatible mixtures of two or more of these impregnating agents. These solutions and dispersons preferably have a solids content of 3 to 75% by weight with a viscosity of for

example between 14 and 60 seconds (according to the DIN cup, 4mm). The optimum viscosity can be adjusted, if necessary, by co-use of water-soluble thickeners, such as polyvinyl alcohol, sodium polyacrylate or alginate. for total saturation, quantities of the impregnating solution or dispersion are applied which contain 1 to 100% by weight of solids, based on the weight per unit area of dry paper to be impregnated. After the suction zone, the saturated strip may be passed into a drying and condensation zone, where the water is evaporated at temperatures of for example from 100 to 180° C and the resin is hardened, if it contains cross-linkable groups.

The transporting means for the strip of absorbent paper may consist of a suitable arrangement of guide rollers which determine the path of the strip of paper although if very soft paper with low inherent strength is to be processed, it is preferred to guide the strip of paper in its wet state on a rotating sieve belt, particularly in the region of the suction zone.

The impregnated, dried and hardened papers may be used as decorative films for producing construction materials in sheet form, for example for the furniture industry.

For a better understanding of the present invention a preferred embodiment of the process according to the invention will be described by reference to the accompanying drawings, in which:-

Figure 1 shows schematically a longitudinal section through the central plane of an apparstus for carrying out the process according to the invention; and

Figure 2 shows schematically a longitudinal section through the central plane of a further apparatus for carring out the process according to the invention suitable for incorporation in a paper-making machine.

Looking first at Figure 1, the apparatus consists of a feed roll 1 which delivers paper to be treated via a number of forwarding rolls 2, 3 and 4 to a coating stage where the impregnating liquid 5 is applied on to one surface of the paper by means of an applicator roll 6. The paper next passes to a further forwarding roll 7 which has a wiping device 8 associated therewith which in use serves to remove excess impregnating liquid and thus to control the thickness of the coating on the paper. The coated paper 9 then passes via a still further forwarding roll 10 on to an endless, moving belt sieve 11 which supports the paper as it moves over suction devices 12 and 13. These suction devices comprise perforated suction plates through which a suction pump (not shown) acts. The impregnated paper then passes to the drying zone.

Looking now at Figure 2, the apparatus consists of a forwarding roll 14 which moves paper from a previous stage in a paper making machine via a further forwarding roll 15 on to an endless belt sieve 16. An impregnating liquid is applied on to one surface of the paper through nozzle 17 and the thickness of the coating is controlled by wiper 18. The paper whilst still supported by the belt sieve then moves over suction devices 19, 20 and 21. Further impregnating liquid is next applied by means of a second nozzle 22 whereafter the paper passes via rolls 23 and 24, which comprise a size press, to infra-red heater 25 and thence to the drying device 26.

The endless belt sieve after parting company with the paper is cleaned by a high pressure device 27 before again contacting the paper. Excess impregnating liquid 28 removed by the size press passes through a filter 29 and is collected to reservoir 30 for recycling to nozzles 17 and 22. Similarly excess impregnating liquid removed from the endless conveyor is collected for recycling.

In use, the strip of paper is guided in its wet state on to the moving sieve belt at a speed of, for example, 200 m/min. For coating the surface an applicator roll which dips into a trough containing the impregnating liquid as shown in Figure 1 may conveniently be used. Alternatively, the impregnating liquid may if desired be sprayed on by means of a nozzle as shown in Figure 2, or allowed to flow on. The thickness of the coating applied may be controlled using a spreader strip or wiper as illustrated in the drawings, or with an airbrush.

The coated strip of paper is then conveniently subjected to suction by running it over one or more suction plates or suction boxes in which there is a vacuum. The suction plates, as illustrated in the drawings, have a plurality of perforations. Paper with sufficient wet strength can be drawn freely over the suction plates whilst in the case of paper with little wet strength a sieve belt conveniently runs between the strip of paper and the suction plates again as illustrated. The suction zone and the vacuum prevailing therein are adjusted according to the speed of the paper and the viscosity and quantity of impregnating liquid so that whilst the strip of paper is travelling through the suction zone the impregnating liquid is sucked into the paper through the entire thickness thereof and is absorbed as completely as possible by the strip of paper. The suction effect should preferably not be so strong that the impregnating liquid passes completely through the strip of paper in which case it would emerge on the side of the paper in contact with the sieve belt. Any excess remaining on the surface of the paper can be removed in a size press as shown in Figure 2. If after leaving the suction zone the strip of paper is not adequately saturated with the impregnating liquid,

further impregnating liquid can be applied at the size press stage as illustrated in Figure 2 and this further impregnating liquid will then penetrate easily into the already wetted strip of paper.

The coating zone and the suction zone may overlap partially or wholly. They may also be subdivided so that a first coating zone is followed by the first suction zone, then by a second coating zone and a second suction zone and so on. The strip of paper, if desired on a sieve belt, then passes into the drying zone.

The process of the invention may with advantage be combined directly with the manufacture of the paper. The impregnating apparatus is then conveniently built into the drying part of the paper making machine instead of the otherwise conventional size press. It is appropriate to dry the impregnated strip superficially before it enters the subsequent drying zone by means of an infra-red radiator as shown in Figure 2 or by means of a current of heated air, or by some other means.

The dried strip of paper can then be glazed, stamped, printed and enamelled in the usual way as desired.

WHAT WE CLAIM IS:-

1. A process for the continuous impregnation of a strip of absorbent paper with a solution or dispersion of a synthetic resin which comprises applying the said solution or dispersion on to one side of the said strip of paper in an amount sufficient for saturation of the strip, and subsequently passing the strip through a suction zone in which suction is applied to the opposite side of the strip whereby the solution or dispersion is drawn into the strip by suction.

2. A process as claimed in claim 1 wherein the paper is substantially unsized.

3. A process as claimed in claim 1 or claim 2 wherein the paper has a weight per unit area of from 40 to 300 g/m^2.

4. A process as claimed in any of the preceding claims wherein the said solution or dispersion is an aqueous solution or dispersion.

5. A process as claimed in any of the preceding claims wherein the strip of paper is impregnated with an aqueous dispersion of a polyacrylate or polymethacrylate ester, polyvinyl acetate or polyvinyl chloride.

6. A process as claimed in any of claims 1 to 4 wherein the strip of paper is impregnated with an aqueous solution of a phenol-formaldehyde, urea-formaldehyde or malamine-formaldehyde procondensate.

7. A process as claimed in any of the preceding claims wherein the said solution or dispersion has a solids content of 3 to 75% by weight.

8. A process as claimed in any of the preceding claims wherein the said solution or dispersion further contains a thickener.

9. A process as claimed in any of the preceding claims wherein the said solution or dispersion is applied in an amount (based on the weight of solids) of 1 to 100% by weight per unit area of the paper strip.

10. A process as claimed in any of the preceding claims wherein the strip is subsequently dried and (if the said resin contains cross-linkable groups) optionally hardened.

11. A process as claimed in claim 10 wherein drying is effected at 100° to 180°C.

12. A process as claimed in claim 1 substantially as herein described.

13. A process for the continuous impregnation of a strip of absorbent paper, substantially as herein described with reference to the accompanying drawings.

14. Paper strips whenever impregnated by a process as claimed in any of the preceding claims.

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1564147 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

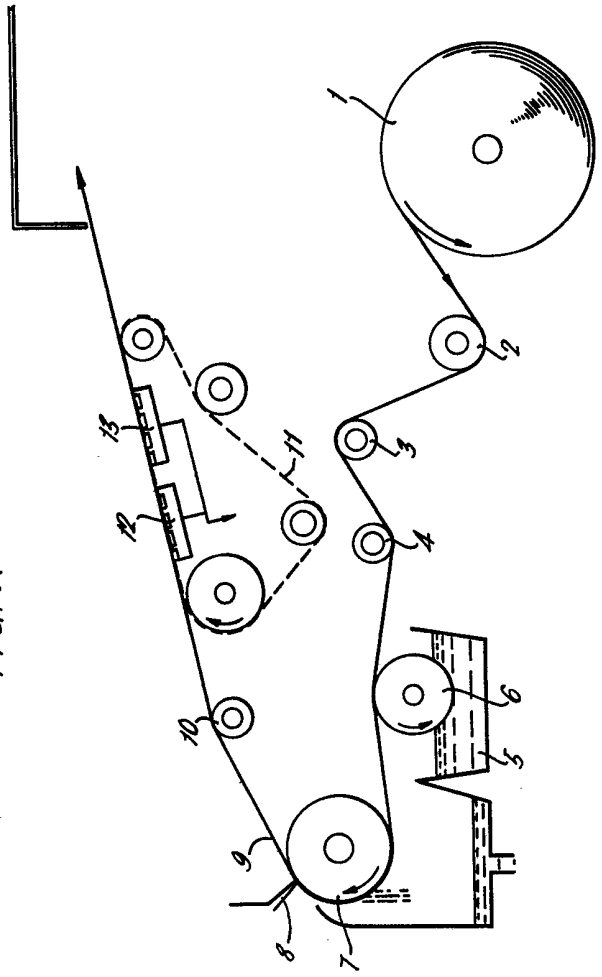

FIG. 1.

1564147 COMPLETE SPECIFICATION

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Sheet 2

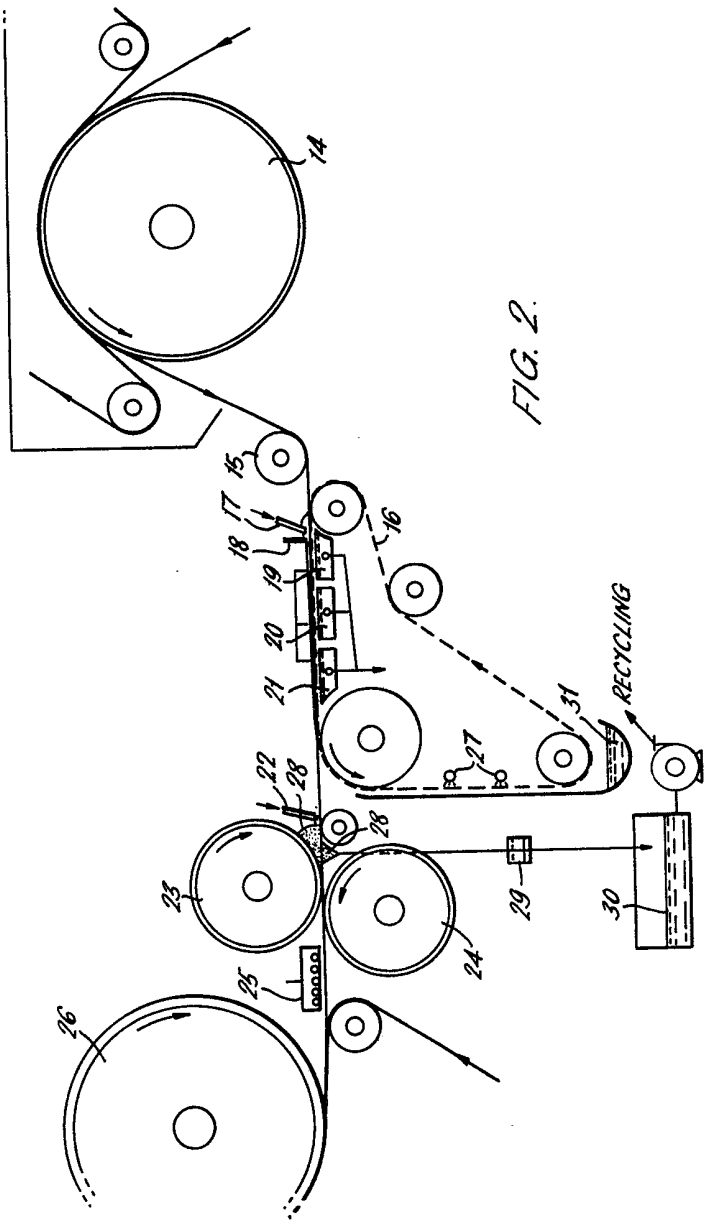

FIG. 2.