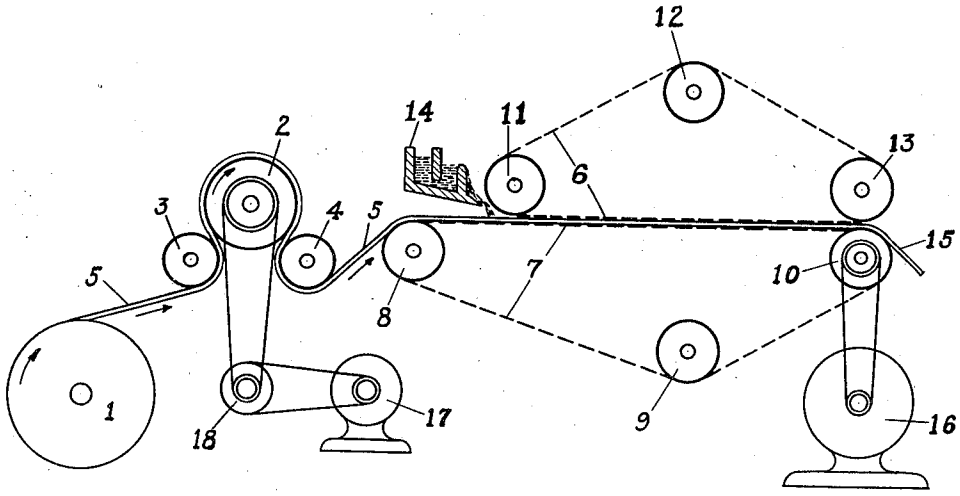
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APPARATUS FOR IMPREGNATING NONWOVEN FABRICS

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APPARATUS FOR IMPREGNATING NONWOVEN FABRICS

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1 Claim. (Cl. 91—43)

This invention relates to the impregnation of cellulosic webs, and particularly to an improved apparatus and method for impregnating non-woven cellulosic, or paper bases.

The impregnation of the non-woven cellulosic webs, or the so-called paper bases, is attended with several difficulties, particularly when aqueous saturants are used as the impregnating material. The aqueous saturants temporarily give rise to an extremely tender system which presents a particularly difficult problem of handling. The immediate result of saturating non-woven cellulosic materials with aqueous saturants is the reversion to a pulp stage in which the cellulosic fibers must be continuously supported until the fibers have regained sufficient strength to produce a coherent sheet capable of supporting its own weight. In addition to the necessity of providing support to the cellulosic fibers during the weak stage, it is equally important that the processing system does not mutilate the plastic mass and that the resultant processed sheet be characterized by complete freedom from wrinkles, folds, tears, rents, etc. Various expedients have been resorted to in order to fulfill the desired conditions, but insofar as we are aware no apparatus has been produced to meet the requirements in a simple and economically operated apparatus.

It has been our observation that the first action which occurs when a non-woven cellulosic material encounters an aqueous saturant is an expansion characterized by elongation along both the length and breadth of the web and by increase in thickness. This action tends to loosen the formation or structure of the sheet, and it is essential that any machine element operating on the treated web must act to at least maintain this structure or formation, and preferably knit more closely the structure of the felted fibers constituting the paper base. It has been our further observation that the usual use of smooth roll machine elements does not accomplish this purpose, but on the contrary tends to further mutilate the sheet by crushing and for this reason tends to yield an impregnated product which is characterized by wrinkles and broken formation.

This invention has as an object an improved apparatus and method for impregnating cellulosic non-woven webs. Further objects will appear hereinafter.

These objects are accomplished by the following invention which, in its preferred form, is carried out by continuously feeding a cellulosic web into a double wire mesh apron or screen system which supports the web throughout substantially the whole of its upper and lower faces during the travel of the web between the application of the impregnating material and the removal of the excess saturant. The excess saturant is removed by applying pressure to the saturated cellulosic web while between screens or immediately after exit from the screens.

The invention will be better understood by reference to the accompanying drawing wherein the single figure represents the side elevation of the apparatus.

In the drawing, 1 represents a roll of the cellulosic web material ready for impregnation. This web is shown as being unwound from the roll by means of a pull roll 2 and auxiliary rolls 3 and 4 in such a manner as to cause the web 5 to be in constant and uniform contact with the periphery of the pull roll 2. The cellulosic or non-woven paper base 5 is directed between a pair of upper and lower aprons 6 and 7. These aprons consist principally of a reticulated material in the form of wire screens having a width substantially equal to that of the paper being impregnated. The lower apron 7 is supported and driven by rolls 8, 9 and 10. The upper traveling wire mesh apron 6, supported and driven by rolls 11, 12 and 13 in a synchronous manner with apron 7, is located in such a position as to press the web 5 against the apron 7. The roll 11 is slightly in advance of the roll 8 so that the web 5 meets the lower apron 7 before being engaged by the upper apron 6. A feed box 14, provided with the usual inlet conduit and ledge for distributing the overflowing impregnating material, is located at a point above roll 8 in such a manner as to allow the saturant to overflow onto the web 5 as it lies supported by apron 7 but not as yet engaged by apron 6. Immediately following the application of the saturant to the web, the treated web is carried forward by apron 7 to roll 11 where the apron 6 engages the treated web. In this manner the saturated web, indicated by 15, is carried forward and protected by the upper and lower screens. Upon reaching the rolls 10 and 13, the excess saturant is expelled by a pressure exerted upon these rolls and acting on the treated web through the wire mesh aprons. In addition to the expulsion of the excess saturant by the rolls 10 and 13, the pressure applied at this point consolidates the formation of the saturated web and gives it sufficient strength to withstand subsequent processing operations. Following the squeezing applied

by rolls 10 and 13, the impregnated web leaves the saturating apparatus and is ready for subsequent processing.

The aprons may be driven in any suitable manner, as for instance by a motor 16 connected by a pulley to the shaft of the roll 10. The upper apron 6 may be driven synchronously with the lower apron by suitable gearing connecting the rolls 10 and 13. The pull roll 2 may also be driven in any suitable manner, as for instance by a motor 17 connected by a pulley to a variable speed drive 18 which in turn is connected to the shaft of the pull roll 2. The variable speed mechanism is employed in order to get perfect synchronization of the lineal speed at the unwind with the lineal speed of the traveling belts and thus avoid stress on the web at the point of engagement with the screens.

The apparatus described above is suitable for impregnating all types of saturating papers and it is especially useful in the impregnation of those highly absorbent felts or papers such as described in U. S. Patent 1,857,100.

Variations for carrying out the invention as described above will be apparent to those skilled in the art. Thus, the feed system may be located between the rolls 11 and 13 so as to supply the saturant to the web through the apron 6. If desired, the saturant may be sprayed from either side or from both sides of the apron so as to supply the saturant to the web through the wire mesh aprons. Again, although the preferred form of the invention consists of a horizontal apron, the invention is not limited to a horizontal type machine and the aprons may be set at any angle just so the aprons are contingent with the treated web and where they squeeze the treated web. There are many possible embodiments of the double apron principle herein described, as for instance dipping the screens and the paper therebetween into baths. Any of the systems known to the art for unwinding the web may be satisfactorily used instead of the one described herein to supply the web to the impregnating apparatus. Although we have found the wire mesh aprons to be more satisfactory, the aprons may be made of any material which will provide the desired support and protection, such as parallel strung wires, fabric, parallel strung cords, etc.

From the foregoing, it will be apparent that we have provided an improved method and apparatus for manufacturing impregnated paper products. The screen type elements and the mechanism described above is markedly more favorable to successful processing of cellulosic webs with aqueous saturants than other mechanisms designed for the same purpose. The use of the screen belts to support and cover the cellulosic web during the saturating operation not only provides support to the cellulosic web during the weak stage, but maintains and improves the structure or formation of the sheet and produces an impregnated product which is characterized by freeness from wrinkles, crush marks, folds, and is thoroughly saturated with the aqueous saturant.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that we do not limit ourselves to the specific embodiments thereof except as defined in the following claim.

We claim:

Apparatus for impregnating with aqueous saturants cellulosic web material incapable of supporting its own weight when wetted with an aqueous liquid to produce unwrinkled, unbroken-formation impregnated cellulosic web material comprising lower and upper continuous porous aprons, said lower apron being suspended over leading and following rolls and said upper apron being suspended under leading and following rolls, the suspended portions of said aprons being disposed face to face, the leading roll of the lower apron being located in advance of the leading roll of the upper apron, a feeding device for an impregnating solution being located in following relation to the leading roll of the lower apron, the centers of two following rolls being in a plane perpendicular to the plane of the aprons therebetween, the said leading and following rolls being arranged to support and confine the cellulosic web material between the said upper and lower aprons with a pressure insufficient to force the impregnating solution away from the said cellulosic web material during impregnation and the following rolls being arranged to apply pressure to the impregnated cellulosic web material between the aprons sufficient to force the excess of the impregnating composition away from the same.

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