Aug. 6, 1929. H. M. EATON 1,723,336

IMPREGNATION AND DRYING APPARATUS

Filed March 2, 1925 2 Sheets-Sheet 1

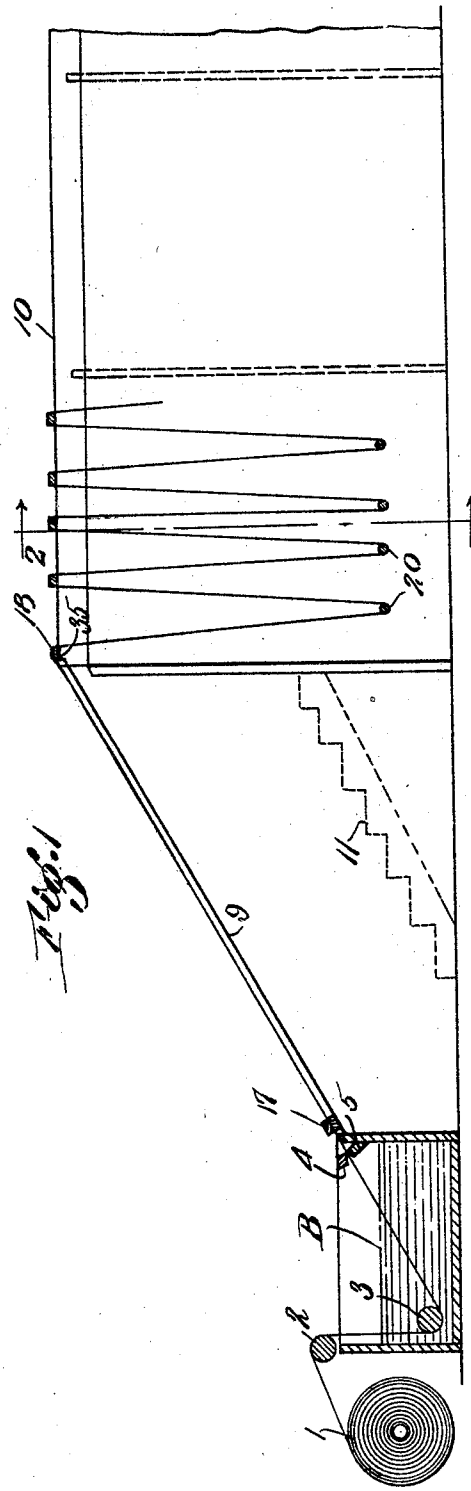


Fig. 1



Fig. 3



Fig. 4

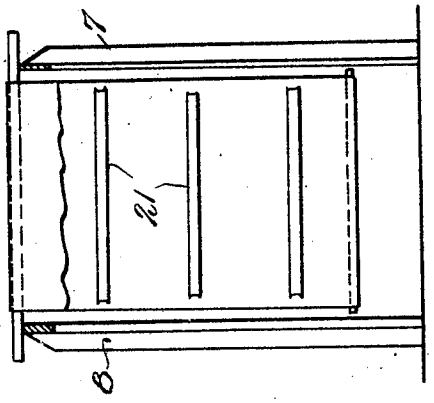


Fig. 2

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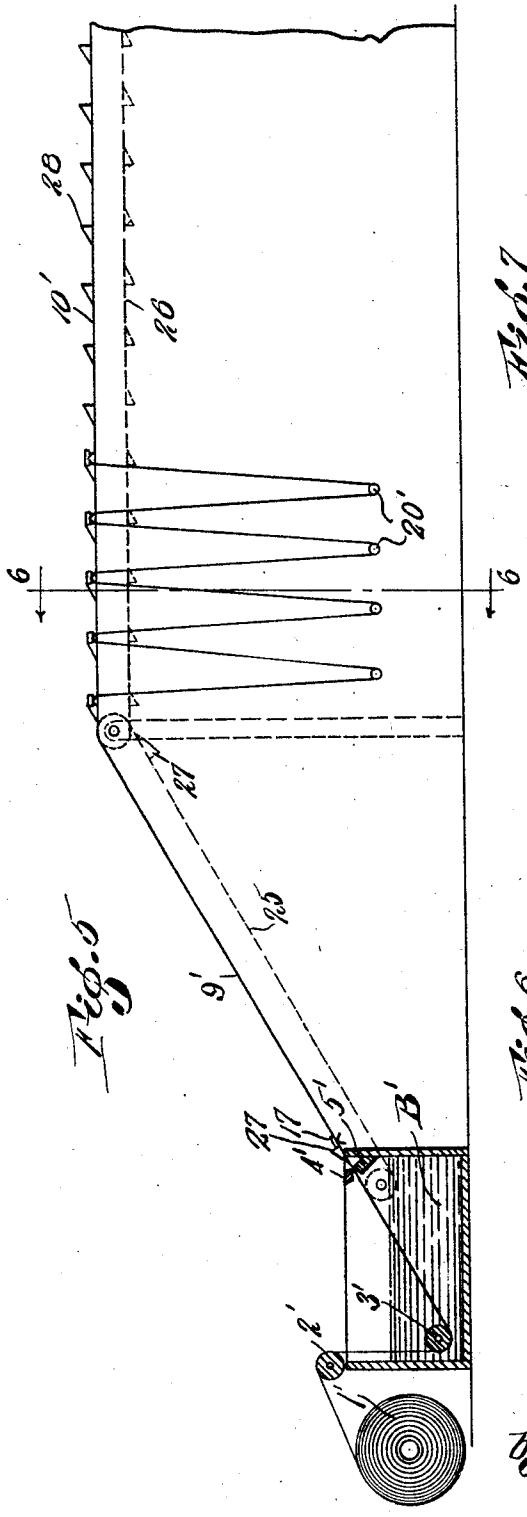


Fig. 5

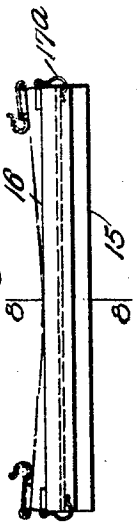


Fig. 7

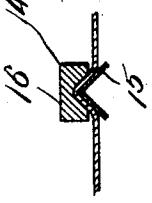


Fig. 8

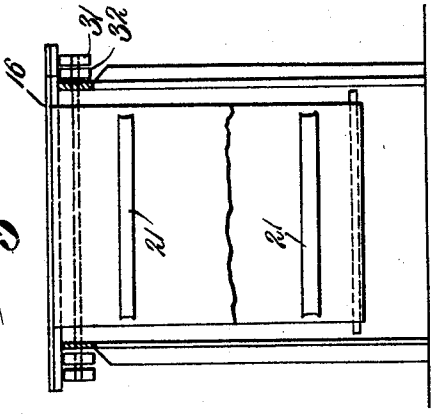


Fig. 6

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UNITED STATES PATENT OFFICE.

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IMPREGNATION AND DRYING APPARATUS.

Application filed March 2, 1925. Serial No. 12,806.

This invention relates to apparatus for the continuous treatment of sheet material with a fluid impregnating agent.

The invention is applicable to the treatment of any materials in sheet form with a fluid impregnating agent but is particularly applicable to the treatment of flat sheets of uniform characteristics occurring in the form of long strips, with a cellulosic impregnating fluid, the material preferably being passed through a bath of the fluid and emerging in a tacky condition on both sides and thereafter being suitably supported during curing until drying is complete.

In its more general aspect the method of the invention comprises the progressive conveyance of a sheet of the material to be treated through a bath of impregnating fluid, and thence to a drying rack on which the material is suspended in loops of predetermined and accurate length, the adjacent sheets being spaced sufficiently to avoid contact and to permit the necessary circulation of air. The material may be drawn through the bath of impregnant by means of clamps applied to the strip adjacent the point of emergence from the bath, the material being drawn between scraping devices, and the clamps being applied to the strip at points spaced apart by distances approximately equal to the length of the material in each loop on the curing or drying rack. The length of each loop is determined by the length of incline 9. The material may be drawn through the bath and moved along the rack manually or it may be automatically or semiautomatically moved. The material is preferably stretched by the application thereto at appropriate points of resilient stretching devices whereby shrinkage and contraction resulting in curvature is avoided.

In its more general aspect the apparatus comprises an impregnating bath and guiding means arranged in such relation to said bath that the material after impregnation may be handled entirely from the sides and may come in contact with a minimum number of parts which would tend to abrade its surface or remove any portion of the coating thereof between the time that the bath is left and the time when drying is completed. The material may be drawn from the bath manually, and clamping devices applicable by the operatives in charge of the mechanism are provided to grip the strip material and to allow the exertion of traction thereon. Portions of the clamps may be employed as supporting means if desired, or separate supporting elements for the upper portions of the loops may be used. Suitable weights or weighted rods may be inserted between adjacent supporting members and occupy positions at the bottoms of the loops of the drying material so as to maintain the material under a moderate tension and to prevent flexure of the material to such an extent that different loops will come into contact with each other. The apparatus may include suitable spring stretchers in the form of resilient members of a length approximately equal to the width of the strip material and having points adapted to pierce the strip material near its edges whereby the material may be drawn taut laterally and kept from shrinkage.

In the accompanying drawings in which, for purposes of illustration, an illustrative embodiment of the invention of the type adapted for manual operation is disclosed, together with a semi-automatic embodiment of the invention,

Fig. 1 is a diagrammatic view in central section;

Fig. 2 is a vertical section indicated by the line 2—2 of Fig. 1;

Fig. 3 is a plan view; and Fig. 4 an edge view of one of the spring stretching devices;

Fig. 5 is a view corresponding to Fig. 1 of a semi-automatic embodiment of the invention, the view being mainly diagrammatic;

Fig. 6 is a section indicated by the line 6—6 of Fig. 5;

Fig. 7 is a side elevation of a clamping device, a portion thereof being indicated in its released position by dot and dash lines; and

Fig. 8 is a section on the line 8—8 of Fig. 7.

Referring first to the embodiment of the invention particularly illustrated in Figs. 1 and 2, 1 represents a roll of the material to be impregnated, which may be supported by any suitable means, not shown. From the roll 1 the material is led over a roll 2, then vertically downward and beneath a roll 3 submerged in a bath B of suitable impregnating fluid. Emerging from this bath the material passes between scraping members 4 and 5 which compact the impregnant into

the material and remove any surplus surface impregnant therefrom. From the scraping device the material is led between a pair of vertical parallel frames 7, 8. These frames provide inclined guiding surfaces 9 and horizontal guiding surfaces 10 along which supporting means for the material may be moved. To facilitate the handling of the material runways 11 are arranged at each side of the frame work up which operatives may pass in pulling the material through the impregnating bath.

Referring now to Figs. 7 and 8, 14 is a clamping mechanism which may comprise a metallic angle member 15 and a cooperating grooved metallic member 16. The latter is preferably bowed and its ends must be bent toward the member 15 when the parts are assembled. This insures a firm gripping of the sheet so as to prevent the center from slipping in the clamp. At the ends of the member 16 are hook elements 17^a which may be engaged beneath the ends of the member 15 when the member 16 is flexed into straight condition. One of these clamps will be applied by the operatives at about the point indicated at 17 and the operatives will then walk up the inclined runways or ramps 11 dragging the clamping members by the opposite ends and allowing the weight of these members to be carried by the inclined guiding surfaces 9. When each clamp 14 reaches the top of the incline it is dropped into a notch 35 to hold the sheet in position until another clamp is applied to the sheet at the lower end of the incline.

After the end of the material from the roll 1 is first brought to the top of the inclined guides 9 it may be attached to a suitable supporting member 18 which may either be an entirely separate element, or, if desired, may simply consist of one of the elements 15, it being possible to leave the clamps in position, or to employ merely the bottom elements of the clamps as supports during curing and drying, or to employ entirely separate transversely extending rods to support the material during drying.

As each successive portion of material is drawn by the clamping means through the vat or bath it will sag, and the length of the inclined surface 9 being approximately equal to twice the vertical dimensions of the loops of drying material, a loop will be formed at the moment when the clamp reaches the top of the incline 9 of substantially the desired dimension. Thereafter, by leaving the clamp in place, or by freeing the clamp and leaving the member 15 in place as a support, or by substituting a separate support member 18 if preferred, a loop is formed which will be independent of the loops in advance of and behind it. Heavy rods 20, preferably under ordinary circumstances of a weight of about 10 pounds, are inserted in the loops for the purpose of holding the material under tension. Spring stretching devices 21 having points 22 adapted to pierce the material in the strip adjacent the edges of the latter may be slightly bowed as best shown in Fig. 4 and their points having been brought into engagement with the material may be released and they will then automatically pierce and stretch the strip laterally. The loops supported by the guides 10 must be shifted along the guides as new loops are formed, but the space necessary for the loops is so slight, that a very great length of material may be accommodated on the drying rack and drying of the loops completed by the time they reach the end of the rack.

Figs. 5 and 6 illustrate a form of the invention in which the number of attendants may be substantially reduced and much of the hand work necessary with the species of Figs. 1 and 2 performed by automatic means. As in the first species described, the strip of material to be treated is drawn off a roll 1′, passes over a guide roll 2′, is drawn beneath a roll 3′ submerged in the bath B′ of impregnating fluid, and passes between the scraping and compacting elements 4′, 5′. As in the first species, inclined guides 9′ are arranged at opposite sides of the path of travel of the strip as it emerges from the impregnating bath and the guides 9′ extend up to the beginning of a pair of horizontal guides 10′. Arranged outside the guides 9′ and 10′ are pairs of traction devices, herein in the form of endless flexible members 25 and 26. The flexible members 25 each carry two abutment members 27 adapted to engage the ends of the clamping devices and to move them up the inclined guides 9. The flexible members 26 each carry a plurality of abutment members 28. The members 25 and 26 are separately driven by any suitable power means, not shown, the speed of the former being much higher than that of the latter, for the function of the members 26 is simply to move loops of impregnated material along the guides 10 during drying, while the members 25 operate to draw the material through the bath B′ and to form the loops. The traction members 25 and 26 are preferably driven from their opposite ends and their adjacent ends pass over coaxial rotary members 31 and 32, which are relatively rotatable with respect to each other. By virtue of their arrangement the flexible members cause the abutment members 27 and 28 to travel in pairs.

The general mode of operation of this apparatus is quite similar to that of the construction previously described. Clamps 14 of the type described are clamped across the strip of wet material and upon engagement by the abutments 27 are pulled upwards along the inclined guides 9′. During this

operation the material between the nearest support upon the guides 10′ and the clamp moving along the guides 9′ sags into a loop and when the clamp reaches the top of the guides 9′ it is deposited upon the guides 10′ in position to be engaged by a pair of abutments 28 and moved along the horizontal guides. The clamps 16 may very advantageously be left in position upon the strip until curing is completed, but if desired these may be replaced by simple transverse rods, the adhesion to which of the strip will be sufficient to prevent slippage. As in the first form of the invention described, weight rods 20′ may be inserted in the loops to keep the material taut longitudinally and the transverse stretchers 21 will prevent lateral shrinkage.

It will be apparent that the apparatus described enables the ready handling of a strip of tacky material in a manner to eliminate the need for the application to one side of the sheet of a strip of paper or the like in order to permit movement over guide rolls, etc. Moreover it will be evident that the strip will be uniformly coated on both sides and will dry substantially plane and that no opportunity is given for sheets to become stuck together.

While I have in this application disclosed two forms which my inventive apparatus may assume in practice, it will be evident that it may assume other forms or be substantially modified without departing from its spirit or the scope of the appended claims.

I claim:

1. Apparatus for treating materials comprising parallel guides, supporting members adapted to engage the material at longitudinally spaced points and supported at their opposite ends upon said guides, and means for maintaining the material between said supporting members under tension both longitudinally and transversely.

2. Apparatus for treating materials comprising parallel guides, supporting members adapted to engage the material at longitudinally spaced points and supported at their opposite ends upon said guides, and means for maintaining the material between said supporting members under tension transversely.

3. Apparatus for treating materials comprising parallel guides, supporting members adapted to engage the material at longitudinally spaced points and supported at their opposite ends upon said guides, and means for maintaining the material between said supporting members under tension transversely including resilient stretcher bars provided with means for engaging said material adjacent its lateral edges.

Signed by me at Boston, Massachusetts, this 27th day of February, 1925.

HORACE M. EATON.