July 4, 1950 W. A. SISSON 2,513,432

LIQUID TREATMENT OF FILAMENTARY MATERIAL

Filed Aug. 14, 1945

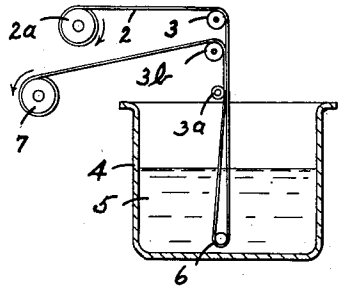


Fig. 1

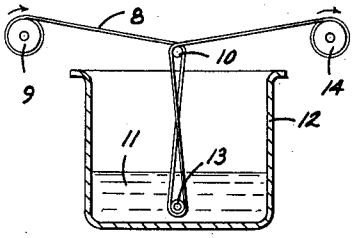


Fig. 2

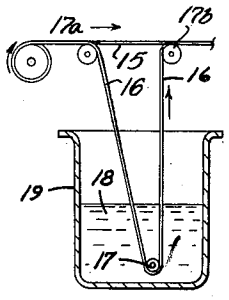


Fig. 3

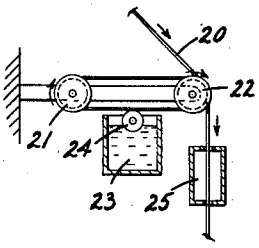


Fig. 4

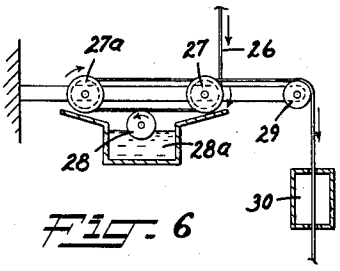


Fig. 6

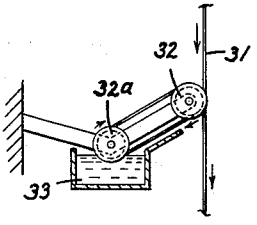


Fig. 8

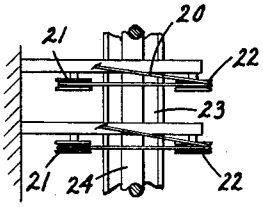


Fig. 5

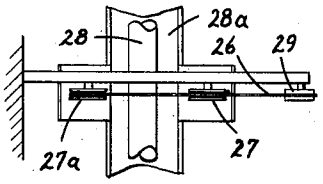


Fig. 7

Fig. 10

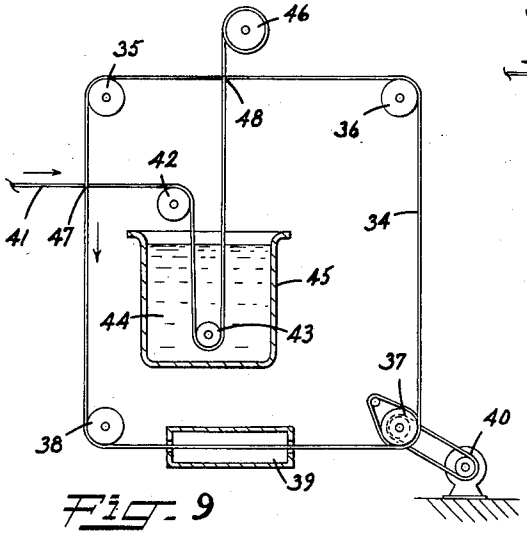
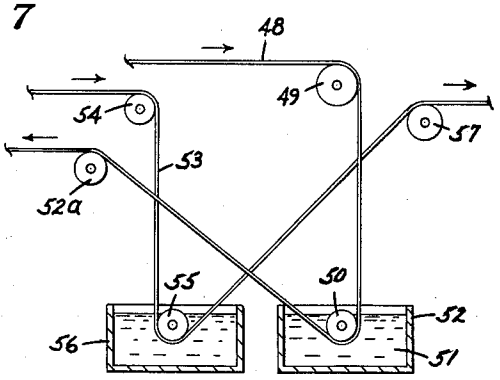


Fig. 9



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LIQUID TREATMENT OF FILAMENTARY MATERIAL

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4 Claims. (Cl. 8—151.2)

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This invention relates to methods for handling continuously travelling fibrous material of indefinite length, and particularly to a method for removing excess liquid therefrom.

In treating fibrous or filamentary material with liquid, it is important to insure that excess liquid is not carried by the material from one liquid-treating stage to another, or from a liquid-treating stage to a drying device or a take-up device. It is also important to insure that the liquid picked up by the material is uniformly and evenly distributed along each succeeding portion thereof to avoid over-coating of some sections of the filaments with consequent inequalities in the finished yarn or thread.

A variety of methods and apparatus have been proposed for removing excess liquid from filamentary material advancing from a liquid-treating stage. However, such procedures usually involve either the use of mechanical implements, such as squeeze rollers, which may have an abrading action on the wet filaments, or they involve comparatively elaborate apparatus including air ejectors, centrifugal devices, etc. In all cases, there is a considerable waste of the treating liquid unless special means are provided for collecting and re-circulating the excess liquid stripped off the liquid-laden filamentary material.

All of the foregoing disadvantages are avoided by the present invention in accordance with which excess liquid is stripped off continuously travelling fibrous or filamentary material and absorbed by comparatively dry continuously travelling fibrous or filamentary material which contacts the liquid-laden material along a portion of its path of travel from a liquid-treating stage at a point removed from such stage.

Preferably the dry fibrous material approaching the liquid-treating bath, and the liquid-treated material advancing from the liquid bath, travel in opposite directions and contact each other for a length of from about 4 to 12 inches at a point adjacent the level of liquid-treating bath.

The accompanying drawing is illustrative of the invention. In the drawing:

Figure 1 is a diagrammatic view in elevation of one embodiment of the invention;

Figures 2 and 3 are diagrammatic views in elevation of modifications of the embodiment shown in Figure 1;

Figure 4 is a diagrammatic view in elevation of another embodiment of the invention;

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Figure 5 is a top view of the modification shown in Figure 4;

Figure 6 is a diagrammatic view in elevation of a further embodiment;

Figure 7 is a top view of the modification shown in Figure 6; and

Figures 8, 9 and 10 are diagrammatic views in elevation of still further modifications of the invention.

As shown in Figure 1, the filamentary material 2 advances from a supply 2a over a rotatable roll 3 and then downwardly into a vessel 4 containing treating liquid 5, under a rotatable roll 6 submerged in the treating liquid and back along rollers 3a and 3b, from whence it may proceed to another liquid treating stage, a drying device, or, as shown, to a take-up device 7. The material proceeding from the bath and back along rollers 3a and 3b follows a path which converges toward the path of the comparatively dry material advancing to the bath, so that for a distance which may vary, but is preferably from about 4 to 12 inches, between roller 3a and the level of the treating liquid, and between rollers 3a and 3b the liquid-laden and dry portions of the filamentary material run in side-by-side contact and rub lightly against each other, so that the excess liquid clinging to the treated material is picked up and absorbed by the dry material approaching the bath. Proper contact may be assured either by suitable relative positioning of the supply and take-up or by running the material through a common groove in the roll 3.

In Figure 2, the filamentary material 8 advances from a supply 9 over rotatable roll 10 and thence passes down through liquid 11 contained in vessel 12, under rotatable roll 13 and upwardly across the material approaching the surface of the bath, back over roller 10 and thence to take-up device 14. At their points of crossing, above the level of the liquid, the treated and untreated portions of the filamentary material rub lightly against each other. The excess liquid clinging to the treated material is absorbed by the untreated material.

The invention also contemplates the liquid treatment of threads in the form of a warp sheet. For instance, in the embodiment of the invention shown in Figure 3, a warp sheet comprising alternate threads 15 and 16 may be advanced horizontally over the level of a liquid bath 18, and the alternate threads 16 of the sheet may be deflected from the horizontal about roll 17a and passed downwardly around a roller 17 sub-

merged in the liquid bath, being then restored by passage around roll 17b to position in the sheet where, by side-by-side contact between the remaining comparatively dry threads 15 and the liquid-laden threads 16 all of the threads of the warp sheet comprising both threads 15 and 16 are uniformly liquid-treated.

In Figures 4 and 5 there is shown an embodiment of the invention in accordance with which comparatively dry filamentary material 20 is advanced around pulleys 21 and 22. As the material travels between the pulleys, it is treated with liquid from a container 23 by means of a roll 24. The liquid-laden material travelling in the groove in pulley 22 lightly contacts the comparatively dry filamentary material and transfers liquid thereto, before proceeding to a drying device 25. The device may be modified so that both the fibrous material advancing to the container 23, and the material travelling from the container run between rollers 21 and 22 and are in contact for the distance between the rollers.

In accordance with the modification shown in Figures 6 and 7, the comparatively dry filamentary material 26 travels around a pair of rollers 27 and 27a. Liquid is applied to the material by means of a rotatable liquid-applying roll 28, which dips into the liquid bath 28a. As the liquid-laden material travels over roller 27, it contacts a portion of the comparatively dry material advancing to the liquid-applying roll, before proceeding, over roll 29, to drying device 30. The arrangement illustrated in Figures 6 and 7 may be modified to permit the dry material and liquid-treated material to contact along the distance between rollers 27 and 27a.

In Figure 8, the comparatively dry filamentary material 31 is passed around a pair of rotatable rollers 32 and 32a arranged so that roller 32a dips into the liquid bath 33. Leaving roller 32, the liquid-treated material passes in contact with a comparatively dry portion of material advancing to the liquid bath.

A further embodiment of the invention is shown in Figure 9. There, an absorbent fibrous strand 34, which may be a ribbon of felt or a bundle of continuous filament rayon, for example, passes continuously around a plurality of rotatable rolls 35, 36, 37, 38, preferably in counter-clockwise direction. Between rolls 37 and 38 the absorbent material passes through a heating unit 39. Roller 37 is driven by a motor 40. Filamentary material 41 is advanced over roller 42 downwardly around roller 43 submerged in a liquid bath 44 in container 45, and is then passed upwardly over roller 46 positioned above the bath. The filamentary material 41, which may be proceeding from a liquid-treating stage contacts the absorbent fibrous strand, as shown at 47, and after leaving bath 44, the liquid-laden material again contacts the travelling fibrous strand, as shown at 48. The fibrous strand 34 is continuously dried as it passes through heater 39.

A still further embodiment of the invention is illustrated in Figure 10. As shown, the filamentary material 48 passes over rotatable roll 49 downwardly and under roll 50 immersed in liquid bath 51 in container 52, and the liquid-laden material then is drawn off over roller 52a diagonally across comparatively dry filamentary material 53 advancing over rotatable roll 54, downwardly and under roll 55 submerged in liquid in vessel 56. The liquid-laden filamentary material 53 is then in turn withdrawn diagonally across a comparatively dry portion of the material 48 advancing to treating liquid 51, and is passed over roller 57 to a further liquid treating device, a wind-up device, or a drying device. There is a constant transfer of excess treating liquid from succeeding liquid-laden portions of material 48 to succeeding comparatively dry portions of material 53, and from liquid-laden portions of the material 53 to comparatively dry portions of material 48.

The filamentary material to be liquid-treated may be proceeding from any suitable source of supply, as for instance from a wound package or cake. Further, liquid-laden material coming from a spinning machine, for example, a machine for spinning artificial filaments in accordance with the wet spinning method, may be brought into contact with comparatively dry filamentary material which absorbs the excess liquid clinging to the freshly spun filaments. The filaments may then be collected, or prior to collection, new impregnants may be applied thereto. Also, the filamentary material may be advancing from a drying spinning cell.

The filamentary material may be stretched to any appropriate extent between several liquid-treating stages and while in the laden condition.

The arrangement may be such that each succeeding portion of the filamentary material leaving the liquid-treating stage is caused to run in side-by-side relation to and in contact with each succeeding dry or comparatively dry portion thereof approaching such stage, or the liquid-laden material may be withdrawn from the liquid-treating stage along a path which crosses the path of the dry material approaching the path at any angle, so long as the liquid-laden and dry filaments are brought into contact with each other at some point removed from the liquid-treating stage. Alternatively, a separate length of filamentary material may be run horizontally, diagonally, or otherwise across and in contact with the continuously travelling liquid-laden filamentary material to effect removal of excess liquid from the treated material simultaneously with liquid treatment of the dry material.

The described method of applying liquid and removing excess liquid from travelling filamentary material requires only the simplest and most readily available apparatus, and is productive of the most satisfactory results both as to absorption of the treating liquid, uniformity of residual liquid at each succeeding portion of the material, and conservation of the treating liquid none of which is wasted.

This invention may be practiced in connection with the application of any type of liquid to any type of filamentary material.

The treating liquid may be applied to the filamentary material either during the course of manufacture thereof, as in the manufacture of artificial filaments from viscose, cuprammonium solutions, protein solutions, resin solutions, etc., or it may be applied to filaments, whether natural or artificial, to better prepare them for textile processing such as knitting, weaving, and like operations, or to effect coloration thereof as desired. Thus the treating liquid may be a desulfurizing, bleaching, washing or other medium as in the case of filamentary material manufactured from viscose, or it may be any other suitable liquid.

For example, it may be a soft finishing agent, a soap solution, a dyebath a sizing solution, a

lustering or delustering agent, or any other liquid or semi-liquid substance which it is desired to apply to filamentary material for any purpose.

Any number of treating liquids may be applied to the filamentary material, and the excess liquid removed from the treated material by contact thereof with comparatively dry filamentary material after each liquid application and prior to impregnating the material with another and different material.

The material from which the excess liquid is removed may be bundles of continuous filaments, yarns formed from filaments or short fibers, ribbons, etc.

It is only necessary that each succeeding portion of the liquid-laden material brush or rub lightly against each succeeding portion of comparatively dry material, which may be a dry portion of the same length of filamentary material or a separate length of filamentary material to effect absorption of the excess liquid from the wet material by the dry material, and no difficulty is experienced due to abrasion of the filaments resulting from undue friction therebetween.

As an example of the efficiency resulting from the practice of the invention, when a 300 denier, 120 filament yarn was passed through a "soft finish" solution at a speed of 400 meters/min. using an arrangement similar to that shown in Figure 1, the treated yarn, which was collected in skein form, was found to have retained 85% by weight of the solution clinging thereto (bone dry basis), after contact with yarn advancing to the liquid-treating stage.

Although the invention has been described and illustrated in terms of specific embodiments thereof, it will be readily apparent that modifications may be made without departing from the spirit and scope of the invention and the appended claims.

I claim:

1. A method of conditioning filamentary material which comprises continuously passing a bundle of continuous filaments in comparatively dry condition to and through a liquid-treating stage, and then passing the liquid-treated bundle in a path along which succeeding portions thereof contact succeeding comparatively dry portions of the bundle of filaments advancing to the liquid-treating stage to transfer excess liquid from the liquid-treated portions to the comparatively dry portions without any appreciable compacting of the bundle.

2. A method of conditioning filamentary material which comprises continuously passing a bundle of continuous filaments in comparatively dry condition to and through a liquid-treating stage, and then passing the liquid-treated bundle in a path along which succeeding portions thereof run in side-by-side contact with succeeding comparatively dry portions of the bundle advancing to the liquid-treating stage to transfer excess liquid from the liquid-treated portions to the comparatively dry portions without any appreciable compacting of the bundle.

3. A method of conditioning filamentary material which comprises continuously passing a bundle of continuous filaments in comparatively dry condition to and through a liquid-treating stage, and then passing the liquid-treated bundle in a path along which succeeding portions thereof advance across and in contact with succeeding comparatively dry portions of the bundle advancing to the liquid-treating stage to transfer excess liquid from the liquid-treated portions to the comparatively dry portions without any appreciable compacting of the bundle.

4. A method of conditioning filamentary material which comprises continuously advancing a warp sheet comprising a plurality of comparatively dry bundles of continuous filaments above the level of a liquid bath, continuously passing at least alternate bundles of the sheet downwardly to and through the bath, and continuously passing the liquid-treated bundles upwardly from the bath and into side-by-side contact with comparatively dry bundles of the warp to transfer excess liquid from the liquid-treated bundles to the comparatively dry bundles without any appreciable compacting of the bundles.

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