Dec. 18, 1945. E. KNIGHT 2,391,096

APPARATUS FOR THE LIQUID TREATMENT OF FIBROUS MATERIAL

Filed Nov. 12, 1941

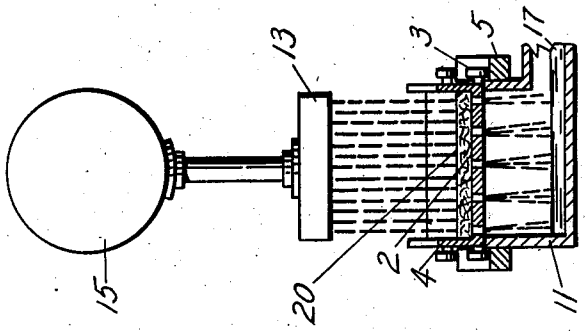


FIG-2-

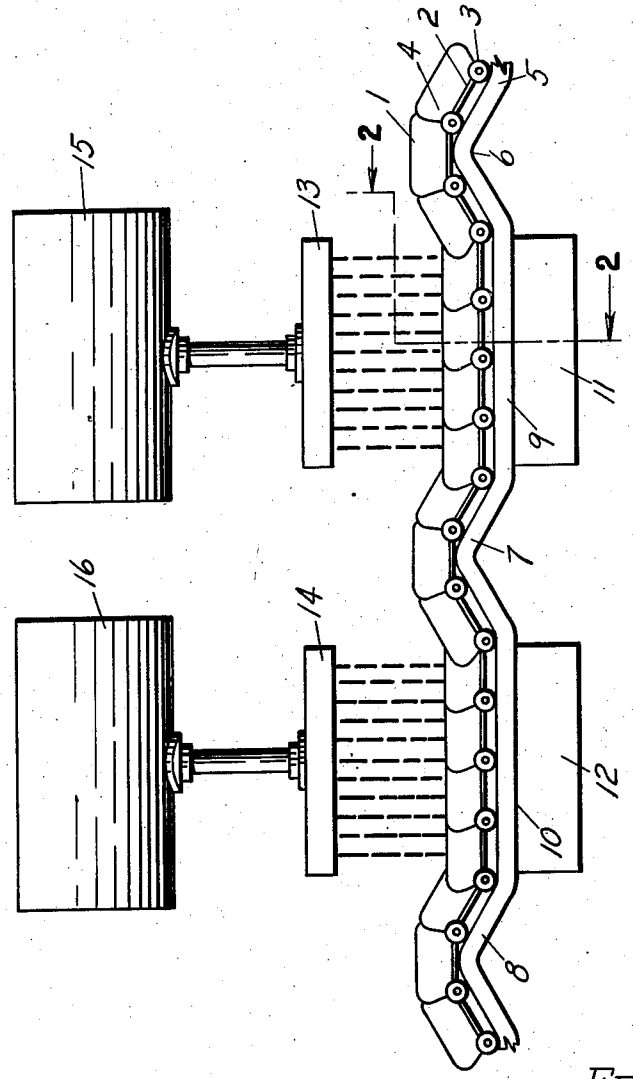


FIG-1-

INVENTOR.
EDWARD KNIGHT
BY Thomas R. O'Malley
ATTORNEY

Patented Dec. 18, 1945 2,391,096

UNITED STATES PATENT OFFICE

2,391,096

APPARATUS FOR THE LIQUID TREATMENT OF FIBROUS MATERIAL

Edward Knight, Nitro, W. Va., assignor to American Viscose Corporation, Wilmington, Del., a corporation of Delaware

Application November 12, 1941, Serial No. 418,758

4 Claims. (Cl. 68—9)

This invention relates to improvements in processes and apparatus for the liquid treatment of textile fibers. More particularly, the invention relates to improvements in processes and apparatus for subjecting staple fiber to successive liquid treatments with various solutions and with the wash waters for removing the residual solutions after such treatments.

Liquid treatment of textile fibers is a common practice, both with natural and synthetic materials. The more rigid requirements of the synthetic fibers, such as viscose rayon staple fiber, present a number of difficulties when endeavoring to use the liquid processes and apparatus therefor which are known to the art at present. For example, it is usual practice in the process of manufacture of viscose staple fiber to accomplish successive liquid treatment steps as follows: (1) divesting the staple fiber of residual spinning bath; (2) desulphurizing and divesting of residual desulphurizing agent; (3) bleaching and divesting of residual bleaching agent; (4) incorporation of a suitable finish to render the fibers susceptible to textile processing. It is essential that the liquids be uniformly distributed throughout the fibrous material and that the residuum from one treatment be completely removed before the succeeding treatment begins; otherwise the one will interfere with the action of the other. However, it is not desirable to subject rayon staple fiber to violent agitation as commonly used with certain other types of fibers to insure thorough liquid treatment and complete dispersal and removal of extraneous soluble material. Fibers of diameters and lengths representative of rayon staple fiber will, as a result of such agitation, form neps. Neps by definition are tangles in fibrous material which cannot be untangled without damage to the filaments. The fibers will also mat or felt together and be less pervious to the treating liquids.

There are in use a number of various types of machines for liquid treatment of staple fiber comprising conveyors of perforate trays, woven wire belts, reciprocating rails, etc. However, all of these types leave something to be desired with regard to the rapidity and uniformity with which the liquids penetrate a mass of staple corresponding to a reasonable rate of production. In many cases the machines operate in such a manner as to permit considerable mixture of the treating liquids, and the ability to give effective wet treatment with avoidance of sufficient felting or mechanical disturbance to give rise to filament damage or nep formation is a problem of considerable seriousness.

This invention has for its principal object to provide improvements in processes and apparatus for the liquid treatment of textile fibers in successive stages.

A further object of the invention is to provide improvements in processes and apparatus for the continuous treatment of textile fibers with various treating liquids in successive stages comprising means for cutting the fibrous material into locks and arranging them in a substantially non-felted mass, continuously conveying this mass from one treating point to another with substantially no mechanical disturbance or agitation until the successive treatments are completed; rapidly and uniformly bringing treating liquids into intimate contact with the fibrous material, with substantially no mechanical disturbance of the latter; preventing one treating liquid from mixing with another; reducing to a minimum the residual liquid held by the fibrous material after each successive treatment; and recovering and recycling the excess treating liquid.

Other objects and advantages of the invention will be apparent from the following description and accompanying drawing.

In the drawing

Figure 1 is an elevational view of a preferred embodiment of the invention.

Figure 2 is an elevational view, partially in section, on the line 2—2 in Figure 1.

Referring to the drawing, reference character 1 indicates generally a continuous linked conveyor member for transporting staple fibrous material from one liquid treating station to another, which conveyor passes over sprocket wheels and is driven by suitable means which are not shown. The conveyor member is made up of perforated plate sections 2 pivotally connected together, having overlapping vertical side portions 4 and capable of being flexed in both directions from its normal plane. The conveyor member is provided with roller members 3 which are arranged to travel on the track generally indicated by reference character 5 which comprises a pair of rails having a plurality of substantially horizontal portions 9 and 10 positioned between inclines or rises 6, 7 and 8. Liquid treating stations comprising the spray heads 13 and 14 are positioned above the horizontal portions of the tracks. The spray heads are supplied with treating liquid from the reservoirs 15 and 16. Suction boxes 11 and 12 are positioned beneath the spray heads 13 and 14 with their upper extremities in contact with the under side of the conveyor plates. Means may be provided to form a sub-

stantially air tight seal between the suction boxes and the conveyor plates. Each of the suction boxes is provided with means not shown for maintaining a partial vacuum in the box and means such as 17 for discharging the liquid and gas that is drawn into the box. The liquid that is discharged may be recirculated to the reservoirs. While only two liquid treatment stations are shown, this is by way of illustration and it is intended that any number desired may be employed.

In carrying out the invention, for example in treating staple fibers made by the viscose process, continuous filaments of regenerated cellulose are first formed and then collected in a tow which is cut into locks of fibers of staple lengths by a cutter such as of the type shown in the United States patent to Beria 1,723,998. The locks of staple fibers are spread over the conveyor member which is in continuous motion to form a more or less compact mass substantially without felting the fibers together. As the conveyor passes beneath the sprayer heads, the staple fiber is subjected to various treating liquids in successive stages, such as washing, bleaching, desulfurizing, finishing, etc. The liquids are drawn through the mass of staple fibers by the suction boxes and may then be recirculated to the reservoirs. The staple fiber is subjected to liquid treatment while the conveyor is in the horizontal portion of the tracks. Due to the rise in the tracks, the portions of the conveyor before and after the horizontal portion where the staple fiber is being treated with liquid are inclined. The inclined portions of the conveyor prevent the liquid from flowing along the conveyor and mixing with liquid at the other treating stations and confines it to an area substantially over the suction boxes.

By means of this invention, large quantities of staple fiber may be continuously treated with various treating liquids in successive stages, and the respective liquids may be recovered for recirculation without being contaminated by liquid from a preceding or following stage.

If desired the suction boxes may be so spaced with reference to the spray heads as to remove the excess liquid mechanically held by the mass of staple before it leaves each stage.

It is to be understood that changes and variations may be made in the invention without departing from the scope of the invention as defined in the appended claims.

What I claim is:

1. Apparatus for the liquid treatment of fibrous material comprising perforate conveyor means, a track on which the conveyor is supported adjacent its sides for movement along the track, means for applying liquid to fibrous material on the conveyor means, means for elevating a portion of the conveyor means adjacent each side of the region where the liquid is applied to confine the liquid applied and prevent its flowing along the conveyor means comprising rises in the track, and means positioned beneath the conveyor for withdrawing liquid from the fibrous material.

2. Apparatus for the liquid treatment of fibrous material comprising perforate conveyor means, a track on which the conveyor is supported adjacent its sides for movement along the track, a plurality of spaced apart means for applying liquid to fibrous material on the conveyor means in regions spaced apart along the conveyor means, means for elevating a portion of the conveyor means adjacent each side of the regions where the liquid is applied to confine the liquid applied and prevent its flowing along the conveyor means comprising rises in the track and means positioned beneath the conveyor for withdrawing liquid from the fibrous material.

3. Apparatus for the liquid treatment of fibrous material comprising a conveyor means having pivotally connected perforated plate sections for continuously transporting fibrous material and supported for movement on a track, means for applying liquid to fibrous material on the conveyor means, means for elevating a portion of the conveyor adjacent each side of the region where the liquid is applied to confine the liquid applied and prevent its flowing along the conveyor means comprising rises in the track, means for drawing liquid through the fibrous material comprising suction boxes positioned beneath the conveyor means between the rises in the track and in contact with the plate sections.

4. Apparatus for the liquid treatment of fibrous material comprising perforate conveyor means, a track on which the conveyor is supported for movement along the track, means for applying liquid to fibrous material on the conveyor means, means for elevating a portion of the conveyor means adjacent each side of the region where the liquid is applied to confine the liquid applied and to prevent its flowing along the conveyor means, said elevating means comprising rises in the track, and means positioned beneath the conveyor for withdrawing liquid from the fibrous material.

EDWARD KNIGHT.