July 25, 1950 J. E. SPALDING ET AL 2,516,268

APPARATUS FOR THE TREATMENT OF FILAMENTS IN CONTINUOUS BUNDLES WITH LIQUID

Filed Sept. 7, 1944

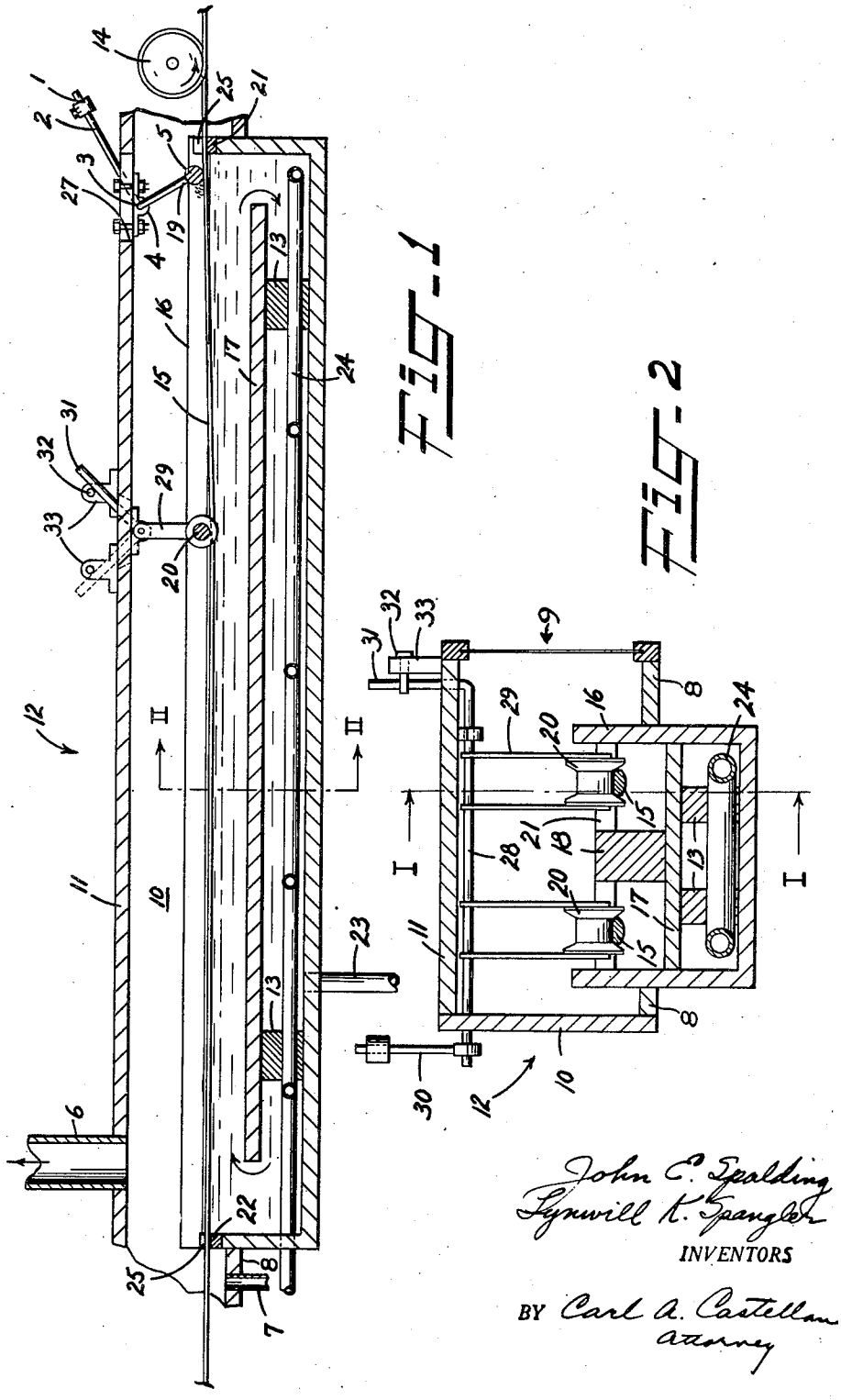


FIG-1

FIG-2

John C. Spalding
Lynwill K. Spangler
INVENTORS

BY Carl A. Castellan
Attorney

Patented July 25, 1950

2,516,268

UNITED STATES PATENT OFFICE

2,516,268

APPARATUS FOR THE TREATMENT OF FILAMENTS IN CONTINUOUS BUNDLES WITH LIQUID

John E. Spalding, Nitro, and Lynwill K. Spangler, Parkersburg, W. Va., assignors to American Viscose Corporation, Wilmington, Del., a corporation of Delaware

Application September 7, 1944, Serial No. 552,970

10 Claims. (Cl. 68—175)

1

This invention relates to apparatus for the liquid treatment of tows or other bundles of filamentary material.

One object of the invention is to provide a compact form of apparatus of simple construction, in which the filaments are continuously drawn through the treating liquid and the liquid is circulated by the action of the filaments as they are drawn through the treatment channel. Another object is to provide means for controlling the concentration of the liquid treating medium by controlling the amount of liquid withdrawal by the filament mass. Other objects and advantages of the invention will be apparent from the drawing and the description thereof.

Figure 1 is a longitudinal vertical cross-section taken on line I—I of Figure 2; and

Figure 2 is a large scale transverse cross-section taken on the lines II—II of Figure 1.

Referring to the drawing, numerals 15 designate running tows entering the trough 16 through guiding notches or grooves 25 of a guide bar 22 and leaving it through similar grooves 25 of a guide bar 21 which is somewhat higher than guide bar 22. A low roll or godet 14 beyond one or more of such troughs may serve to draw the tow through the treating apparatus.

Within the trough 16 a false bottom 17 rests on narrow members, such as blocks 13 so as to permit liquid flow along the entire length of the false bottom. The false bottom 17 substantially fills the entire width of the trough, but each end is spaced from the end walls of the trough 16 about the same distance. As shown in Figure 2, there are two tows 15 being passed through the channel above the false bottom, and these tows are widely separated, the space between them being partitioned by a mid-feather or wall 18 extending the full length of the false bottom. The tows may be run much closer together, and when sufficiently close, no separating wall 18 is needed. However, the inside width of an unpartitioned individual channel between the walls of the trough 16, or between adjacent walls 18 and/or trough walls, whichever happens to be the case, should not be greater than about three times the total width of the tow or tows passing through the individual channel. Preferably, the ratio of the inside width of the individual channel to the total tow width is about 1½ to 2. When the tows are much closer than this, it is again desirable to provide midfeathers between each adjacent tow to prevent any possible entanglement as they pass side by side.

A heating or cooling coil 24 may be positioned

2

in the trough 16 beneath the false bottom 17. A pipe 23 may be connected to the trough 16 for fortifying or replenishing the treatment liquid therein.

A housing 12 comprising a roof 11, side wall 10, and hinged wall or sash 9, has a floor 8 which surrounds the trough, is lower than the guides 21 and 22, and is sloped so that any liquid that splashes out of trough 16 during lacing-up or regular operation is caught thereby and flows to a suitable drain. The roof 11 may be provided with a duct 6 through which any gases given off during the liquid treatment may be sucked off by an exhaust fan or pump (not shown). When the tows are passed successively through a plurality of treatments in similar troughs 16 arranged in tandem, a common drain 7 and duct 6 may serve the whole battery. However, if desired, each liquid-treating section or any selected group thereof may be served by its particular drain 7 and/or duct 6, suitable dams being provided on the floor 8 and/or roof 11 respectively to control the flow of liquids or gases respectively.

A transverse fixed non-rotatable stripper rod 5 such as of glass or porcelain rests upon the tow in advance of its passage through the exit guide 21, and is carried by an arm 19 extending from a shaft 3 which is pivotally mounted in a bracket 4 secured as by bolts to the roof 11. An adjustable counterweight 1 is threaded on an arm 2 extending from one end of shaft 3. Also, the position of the stripper assembly is adjustable longitudinally of the trough 16 by loosening the bolts and sliding them along the slot 27 in the roof 11.

Immersion guide rods 20 may be suspended from the roof 11. As shown, they are secured to a shaft 26 by arms 29, the shaft being pivotally mounted to permit the rods 20 to be moved into operative relation with the tows or out of the way during lacing, as desired. A counterweighted arm 30 is secured to one end of the shaft and a lever arm 31 extends from the other end. A removable pin 32 may be placed at will in the bore of either of two projections 33 to serve as a detent to hold the rods 20 in whichever position is desired at a given time. Generally, adequate immersion can be obtained without the use of guides 20, but they are desirable as an assurance of proper treatment, especially when disturbing conditions may arise.

The apparatus is of use for the treatment of tows and the like with numerous liquids, such as washing, scouring, bleaching and dyeing liquids. It is particularly advantageous for apply-

ing the various after-treating liquids which are applied in the manufacture of artificial filaments from viscose, cuprammonium cellulose, casein, and so on by the wet-spinning process. Thus, it may be used to plasticize the tow of freshly spun filaments made from viscose during stretching thereof by application of hot water or hot dilute acid or salt baths thereto; to desulfurize; to wash; to bleach; to apply a softening agent; and so on.

In operation, the tow or tows 15 induce flow of the treating liquid in the same direction as its direction of travel above the false bottom 17 and the liquid flows over the end of the false bottom near the exit of the trough 16 and then recirculates under the false bottom back to the tow entrance. As it passes back, it is heated by the coil 24 or any equivalent means. The exit guide bar 21 is sufficiently above guide bar 22 and consequently above the level of liquid in the trough 16 controlled by the guide 22, so that the tows completely emerge from the liquid in advance of the exit guide bar 21 and also of the stripper 5. The stripper 5 is placed to contact the tows in advance of the exit guide bar 21, so that compacting pressure is exerted on the opposite sides of the tow at adjacent points offset along the tow. Its pivotal mounting allows it to rise quickly in response to the passage of knots or slubs making the tow of greater size than normal without subjecting the tows to excessive tension. This is of special importance when the tows are being stretched while they pass through the liquid, since, otherwise, tearing and breakage occur.

The device is easily laced up. The sash 9 is opened up for this purpose and any rods 20 are placed in inoperative position. Thus, the whole system comprising one or a series of such treatment receptacles is open without obstruction along one side and the tow may merely be drawn by hand and successively placed into the open guiding grooves of the bars 21 and 22, lifting the strippers 5 out of the way momentarily until the drawing godet 14 is reached.

The adjustment of the offset distance between the stripper 5 and the exit guide bar 21 and the adjustment of the effective pressure of the stripper by means of the counterweighted arm 2 serves to vary and control the amount of liquid removed by the tow and thus, by correlating these factors with the quality and quantity of replenishment supplied through the pipe 23, the concentration of the treatment liquid can be controlled effectively. Thus, in using the device for plasticizing filaments freshly spun from viscose after they leave the acid coagulating bath, the tow carries a certain amount of acid into the trough 16, fresh water or dilute acid may be supplied at a definite rate by the pipe 23 and the concentration of the acid in the trough is controlled to 1½ to 2% or whatever figure desired by adjustment of the stripper 5. In this application of the device, the liquid is heated to 70° C., or almost as high as 100° C. as is conventional. Similarly, in using the device for applying any other liquid, the concentration of any particular ingredient in the liquid is controlled by controlling the amount of the ingredient added in the replenishment supplied by pipe 23 and the rate of withdrawal by the tow or tows.

While the liquid receptacle 16 is herein referred to and shown as a trough, it is obvious that receptacles having such a relatively great width may be used when a large number of tows are being treated that it would be inappropriate to refer to such a receptacle as a trough.

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

We claim:

1. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, and a pressure member resting on the filament bundle between its position of emergence from the liquid and the exit guide.

2. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, a pressure member resting on the filament bundle between its position of emergence from the liquid and the exit guide, and means for adjusting the pressure exerted by the member on the filament bundle.

3. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, a pressure member resting on the filament bundle be-

tween its position of emergence from the liquid and the exit guide, means for adjusting the pressure exerted by the member on the filament bundle, and means for adjusting the distance of the member from the exit guide.

4. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, a pressure member pivotally mounted on an axis extending transversely of the filament bundle resting on the filament bundle between its position of emergence from the liquid and the exit guide.

5. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, and a pressure member extending transversely of the filament bundle and resting on the filament bundle between the exit guide and the adjacent edge of the false bottom.

6. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, a pressure member pivotally mounted

on an axis extending transversely of the filament bundle resting on the filament bundle between its position of emergence from the liquid and the exit guide, and a guide above the filament bundle for holding it below the liquid level.

7. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, a housing substantially enclosing the receptacle, said housing having a sloped floor below the level of the guides for draining liquid splashed thereon, and a movable side wall for rendering the apparatus accessible for lacing up.

8. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, a housing substantially enclosing the receptacle, said housing having a sloped floor below the level of the guides for draining liquid splashed thereon, a movable side wall for rendering the apparatus accessible for lacing up, and an exhaust duct for removing gases from within the housing.

9. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the re-

ceptacle above the false bottom, a housing substantially enclosing the receptacle, said housing having a sloped floor below the level of the guides for draining liquid splashed thereon, a movable side wall for rendering the apparatus accessible for lacing up, an exhaust duct for removing gases from within the housing, a pressure member pivotally suspended from the roof of the housing about an axis extending transversely of the filament bundle and resting on the filament bundle between its position of emergence from the liquid and the exit guide.

10. Apparatus for the liquid treatment of filaments in continuous bundles comprising an open receptacle for the liquid through which the filaments pass, entrance and exit guides supported on two opposite walls of the receptacle for controlling the travel of the filaments, the exit guide being positioned above the entrance guide so that the filament bundle completely emerges from the liquid bath in the receptacle before it reaches the exit guide, said entrance guide being arranged to limit the depth of liquid in the receptacle, a substantially imperforate false bottom disposed in the receptacle at a level below the entrance and exit guides and having two opposite edges thereof terminating short of the walls supporting the guides and being spaced from the bottom of the receptacle to provide a channel therebetween communicating around the ends of the false bottom adjacent the guides with the space in the receptacle above the false bottom, a housing substantially enclosing the receptacle, said housing having a sloped floor below the level of the guides for draining liquid splashed thereon, a movable

side wall for rendering the apparatus accessible for lacing up, an exhaust duct for removing gases from within the housing, a pressure member pivotally suspended from the roof of the housing about an axis extending transversely of the filament bundle and resting on the filament bundle between its position of emergence from the liquid and the exit guide, a guide pivotally suspended from the roof of the housing, and detent means for selectively holding the pivotally suspended guide in operative position in contact with the filament bundle to hold it below the liquid level and for holding the guide in inoperative position out of contact with the filament bundle to facilitate lacing.

JOHN E. SPALDING.
LYNWILL K. SPANGLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
608,194	Greenwood	Aug. 2, 1898
1,497,196	Potdevin	June 10, 1924
1,979,818	Baker	Nov. 6, 1934
2,212,588	Csanyi	Aug. 27, 1940
2,234,593	Ferm	Mar. 11, 1941
2,248,007	Michaels	July 1, 1941

FOREIGN PATENTS

Number	Country	Date
453,682	England	Sept. 16, 1936