Feb. 1, 1949. H. J. McDERMOTT 2,460,390

MEANS FOR REMOVING EXCESS LIQUID FROM FILAMENTARY MATERIAL

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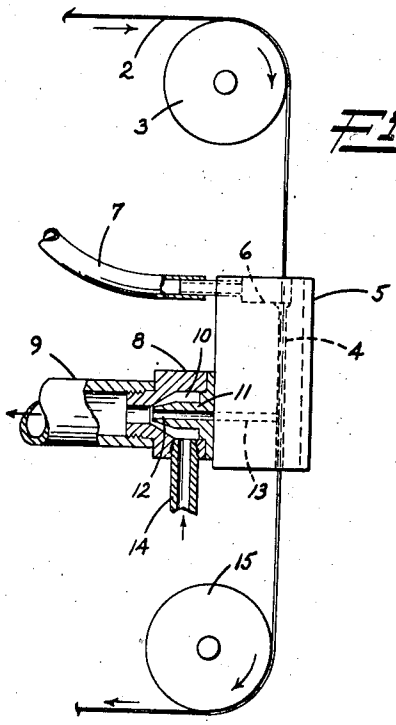


Fig. 1

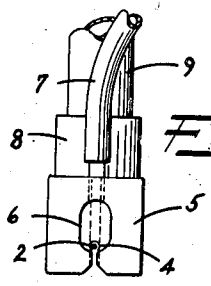


Fig. 2

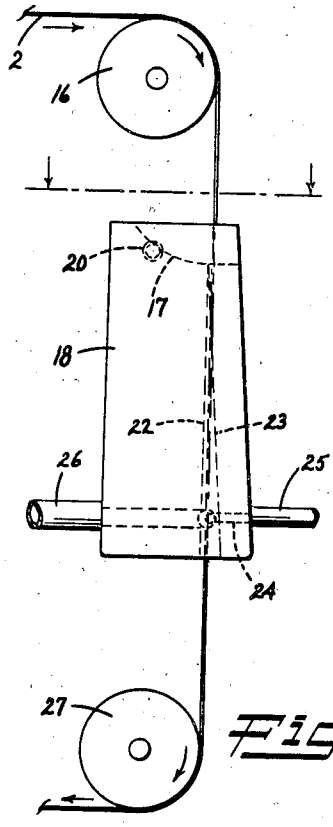


Fig. 3

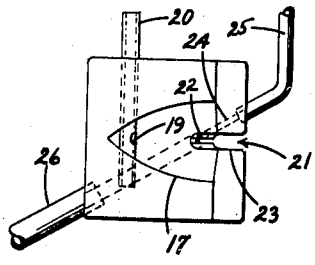


Fig. 4

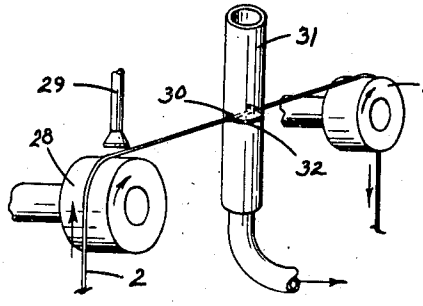


Fig. 5

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MEANS FOR REMOVING EXCESS LIQUID FROM FILAMENTARY MATERIAL

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10 Claims. (Cl. 91—18)

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This invention relates to methods and means for conditioning indefinite lengths of liquid-laden filamentary material advancing continuously to a drying means or the like.

When running lengths of filamentary material such as yarns or threads are treated with water, solutions of finishing agents, or the like, they usually pick up an excess of the treating medium which interferes with subsequent drying thereof or successful application of further treating liquids. Additionally, the amount of excess treating liquid present on the yarn may vary at different portions along the length thereof, which results in inequalities in the yarn which thus does not dry uniformly, especially when it is passed through a drying zone, such as over a drying drum for instance, at the high speeds normally considered desirable.

It is an object of this invention to provide a method and novel means for removing excess treating liquid from liquid-treated filamentary material to better prepare the material for drying or for further liquid treatment, as the case may be.

Another object is to equalize the amount of treating liquid carried by all portions of continuous lengths of liquid-treated filamentary material, so that the moisture content of the liquid-treated material is substantially uniform at all points along the length thereof.

These and other objects are accomplished, according to the present invention, by continuously advancing the liquid-treated thread along a path comprising a confined space and removing the excess liquid therefrom by subjecting the material to the action of suction applied along the course of travel of the material through the confined space. Specifically, the invention contemplates the provision of a substantially enclosed thread-treating device comprising a thread-bearing surface constituted by a bore, slot or slit extending longitudinally of the device, and also comprising means for continuously subjecting the liquid-laden thread moving along the thread-bearing surface to the action of suction applied interiorly of the thread-treating device. The suction acting upon the liquid-laden material traveling along the thread-bearing surface in a substantially confined space causes any excess treating liquid carried by the

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thread to deviate from the path along which the thread advances through the thread-treating device, the excess liquid being withdrawn from the vicinity of the thread and the interior of the thread-treating device without effecting any change in the direction of travel of the material itself. The excess treating liquid may be conveyed to a waste disposal or regenerating system or it may be recirculated for use in treating further lengths of filamentary material.

In accordance with on embodiment of the invention, suction may be applied in such manner as to cause air to be drawn from the atmosphere across the material traveling along the thread-bearing surface of the thread-treating device, the atmospheric air passing across and in contact with the traveling material serving to drive off the excess liquid from the material, and the air and liquid being continuously sucked off to the outside of the thread-treating device. Alternatively, the arrangement may be such that air or other gaseous fluid under pressure is blown into the thread-treating device and across the path of the filamentary material moving along the thread-bearing surface of the device, the air and excess liquid propelled away from the filamentary material by the force of the air stream striking thereagainst being withdrawn from the vicinity of the material and the interior of the device by suction applied continuously to the interior of the device from a direction opposing that in which the air is blown into the device.

It is preferred to maintain the air under a comparatively low pressure, so that the filamentary material is subjected to only relatively slight pneumatic pressure as it travels through the substantially confined space which does not strain or otherwise damage the material.

Various types of devices may be used in carrying out the invention, certain preferred arrangements being shown in the accompanying drawings, in which:

Figure 1 is a side view, partly in section, of one embodiment of the invention;

Figure 2 is a top view of the device shown in Figure 1;

Figure 3 is a side view of another embodiment of the invention;

Figure 4 is a top view of the device shown in Figure 3; and

Figure 5 is a view in perspective of still another embodiment of the invention.

Referring first to the embodiment shown in Figures 1 and 2, the filamentary material is shown advancing over a guide roll 3 and through a slot 4 extending longitudinally of a thread-treating device 5. As shown, the device 5 takes the form of a rectangular block which may be constructed of any suitable material including porcelain, a resin of the type of Bakelite, or the like. The device is substantially enclosed except for slot 4, and comprises a well or trough 6 in the top thereof into which treating liquid is introduced by means of a pipe or tube 7. The thread or other filamentary material passes through the well containing the treating liquid on its way to slot 4. Attached to the device is an air ejector 8 which is connected to a suitable discharge pipe, such as flexible tubing 9. The air ejector comprises an annular chamber 10 into which projects a nozzle-like member 11 having a centrally disposed bore 12 which communicates with a bore of like diameter extending transversely of thread-treating device 5 and which terminates at slot 4. Air under pressure is introduced into chamber 10 through a tube or pipe 14. As the filamentary material advances through slot 4, it passes the mouth of bore 13.

The air in chamber 10 is continuously discharged through tube 9, and the suction thus created in the bore 12 causes atmospheric air to be drawn into slot 4 across and in contact with the filamentary material, the air and the excess treating liquid driven off the filamentary material thereby being continuously withdrawn through bores 12 and 13 and conveyed to the outside through tubing 9. The excess treating liquid is thus removed from the filamentary material and conveyed from the vicinity of the material and from the interior of the thread-treating device, avoiding a sloppy condition in the device and insuring that the filamentary material emerging from slot 4 carries the minimum amount of residual treating liquid, which amount is uniform throughout the entire length of the material. The material discharged from slot 4 may be guided by means of a roller 15 or the like, to a drying zone, or it may be passed over a drying drum or the like, or advanced to another liquid-treating stage. If desired, roller 15 may itself constitute a drying element.

In the embodiment of the invention represented by Figures 3 and 4, the filamentary material 2 advancing over roller 16 passes through a trough or well 17 in the top of a thread-treating device 18, similar to the thread-treating device shown in Figures 1 and 2, the well being supplied with treating liquid introduced through an orifice 19 in a tube 20 positioned in the well. The thread carrying an excess of the treating liquid passes into and through a slot 21 in the device 18, which except for the slot is otherwise substantially enclosed. Slot 21 is constructed so that it comprises two portions extending the length of the device, a narrow portion 22 and a wider portion 23, the edges between the two portions serving to deflect slubs or slugs in the thread into the wider passageway (portion 23) until they have passed out of the slot, thus preventing the slubs from being trapped in the narrow passageway 22 through which the thread normally travels, and guarding against the thread breaking or becoming otherwise damaged.

Thread-treating device 18 comprises a bore 24 extending diagonally thereof across slot 21. Air

or other gaseous fluid under pressure is supplied to bore 24 through tube 25 which communicates with one end of bore 24 by means of a blower (not shown). A stream of air is thus directed against the filamentary material as it advances through the slot and past the mouth of bore 24. The air blows the excess liquid away from the traveling thread. Air and the excess treating liquid diverted from the path of the traveling material are sucked off through a tubing or pipe 26, one end of which communicates with the end of bore 24 opposite the air inlet end, and the other end of which tubing is connected to a suction device, not shown. The thread emerging from the discharge end of slot 21 is passed to a suitable drying means or to a further liquid-treating stage, being guided by roller 27.

With reference now to Figure 5, there the thread or yarn 2 advances over a roller 28, on which it is treated with a liquid supplied by a spray or nozzle 29 positioned above the roller. The liquid-laden material then passes through a hole 30 in the thread-treating device constituted by tube 31, and through a slit 32 in the tube, and thence to a drying device or further liquid-treating stage, over roller 33. The discharge end of the tube may be connected with suitable suction apparatus, not shown. Suction thus applied to the interior of the tube will cause air to be drawn from the atmosphere through the tube and across the filamentary material passing through the slit. The indrawn air and excess treating liquid propelled away from the material thereby are sucked away from the vicinity of the slit and conveyed to the outside of the tube.

Of course, air or other gaseous fluid under pressure may be supplied to the interior of the tube through the inlet end thereof, if desired. The removal of excess liquid from the travelling filamentary material may also be assisted in this case by the pinching or squeezing action of the sides of the slit passing therethrough, or reliance may be placed upon the squeezing action to which the yarn is subjected as it passes through the slit, in which case the application of suction to the interior of the tube is optional, since the excess liquid will tend to flow downwardly through the tube by the action of gravity. Tube 31 may be formed of a resilient material such as natural or artificial rubber or the like.

Although in the particular embodiments shown and described the invention is illustrated in terms of a thread-treating device having a slit or slot therein which constitutes the substantially confined space in the path of the advancing material, it will be obvious that a thread-treating device having a bore extending longitudinally thereof may be used as well. However, it is preferred to provide the device with a slit or slot, since lacing up operations are thereby facilitated.

It will be apparent that the invention provides a method for conditioning liquid-treated filamentary material of any type, whether natural or synthetic, by removing excess treating liquid therefrom uniformly along the length of the material by means noteworthy for simplicity of construction and efficiency and economy of performance.

It will be noted that, by the provision of a trough or well in one end of the substantially enclosed thread-treating device, the device may function as a combined liquid-treating and conditioning means, since when the trough contains treating liquid the filamentary material advancing to the inlet end of the thread-bearing surface picks up the liquid, the excess liquid be-

ing removed from the material as it passes along the thread-bearing surface, as previously described. Where the thread-treating device is such as to perform such multiple functions, it is, of course, preferably supported in vertical position. However, the liquid-containing trough or well may be dispensed with, the filamentary material being treated with liquid in some other manner, such as shown in Figure 5 of the drawing, for example. In those instances particularly under conditions such that air or other gaseous fluid is introduced under increased pressure into the device and across the path of the travelling material, the thread-treating device may be disposed at any suitable angle to the vertical, such as horizontal, since the air stream will serve to convey the excess liquid discharged from the material along a horizontal or even somewhat upwardly inclined device.

The bore extending transversely of the thread-treating device may be at a right angle with respect to the thread-bearing surface, or it may be disposed diagonally of the thread-treating device, it being only necessary that the outlet end of the bore is so disposed as to facilitate flow of the excess treating liquid away from the vicinity of the thread travelling along the thread-bearing surface and from the interior of the thread-treating device.

Although the invention has been described and illustrated in terms of specific embodiments thereof, it will be understood that variations may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. A thread-treating device comprising a substantially enclosed member having a slot which comprises a narrow portion and a comparatively wide portion extending side by side longitudinally of the member, and means for applying suction interiorly of the member, transversely of the slot.

2. A thread-treating device comprising a substantially enclosed member having side and end walls and a thread-bearing surface extending therethrough, a trough formed in a wall of the member exteriorly of and in advance of the inlet end of the thread-bearing surface, and means for applying suction interiorly of the member, transversely of the thread-bearing surface.

3. A thread-treating device comprising a substantially enclosed member having side and end walls and a slot extending longitudinally thereof, a trough in a wall of the member exteriorly of and in advance of the inlet end of the slot, and means for applying suction interiorly of the member, transversely of the slot.

4. A thread-treating device comprising a substantially enclosed member having side and end walls and having a slot which comprises a narrow portion and a comparatively wide portion extending side-by-side longitudinally of the member, a trough in a wall of the member exteriorly of an in advance of the inlet end of the slot, and means for applying suction interiorly of the member, transversely of the slot.

5. Means for removing excess liquid from continuously advancing liquid-laden filamentary material of indefinite length comprising a substantially enclosed thread-treating member having a thread-bearing surface extending therethrough along which the material advances, a bore extending transversely of the member and

communicating with the thread-bearing surface, and suction means for continuously drawing air through the transverse bore and withdrawing the air and excess liquid removed from the material advancing along the thread-bearing surface thereby to the exterior of the thread-treating member.

6. Means for removing excess liquid from continuously advancing liquid-laden filamentary material of indefinite length comprising a substantially enclosed thread-treating member having a slot extending longitudinally thereof through which the material advances, a bore extending transversely of the member and communicating with the thread-bearing surface, and suction means for continuously drawing air through the transverse bore across the slot and in contact with the material advancing therethrough and withdrawing the air and excess liquid removed from the material advancing along the thread-bearing surface thereby to the exterior of the thread-treating member.

7. Means for removing excess liquid from continuously advancing liquid-laden filamentary material of indefinite length comprising a substantially enclosed thread-treating member having a slot which comprises a narrow portion and a comparatively wide portion extending side-by-side longitudinally of the thread-treating member, a bore extending transversely of the member and communicating with the slot, and suction means for continuously drawing air through the transverse bore across the slot and in contact with the material advancing therethrough and withdrawing the air and excess liquid removed from the material advancing along the thread-bearing surface thereby to the exterior of the thread-treating member.

8. Means for treating continuously advancing filamentary material of indefinite length comprising a substantially enclosed thread-treating member having side and end walls, and a thread-bearing surface extending therethrough along which the material advances, a liquid-containing trough in a wall of the member exteriorly of and in advance of the inlet end of the thread-bearing surface, a bore extending transversely of the member and communicating with the thread-bearing surface, and suction means for continuously drawing air through the transverse bore and withdrawing the air and excess liquid removed from the material advancing along the thread-bearing surface thereby to the exterior of the thread-treating member.

9. Means for treating continuously advancing filamentary material of indefinite length comprising a substantially enclosed thread-treating member having side and end walls, and a slot extending longitudinally thereof through which the material advances, a liquid-containing trough in a wall of the member exteriorly of and in advance of the inlet end of the slot, a bore extending transversely of the member and communicating with the slot, and suction means for continuously drawing air through the transverse bore and withdrawing the air and excess liquid removed from the material advancing through the slot thereby to the exterior of the thread-treating member.

10. Means for treating continuously advancing filamentary material of indefinite length comprising a substantially enclosed thread-treating member having side and end walls, and having a slot which comprises a narrow portion and a relatively wide portion extending side-by-side

longitudinally of the substantially enclosed member through which the material advances, a liquid-containing trough in a wall of the member exteriorly of and in advance of the inlet end of the slot, a bore extending transversely of the member and communicating with the slot, and suction means for continuously drawing air through the transverse bore and withdrawing the air and excess liquid removed from the material advancing through the slot thereby to the exterior of the thread-treating member.

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