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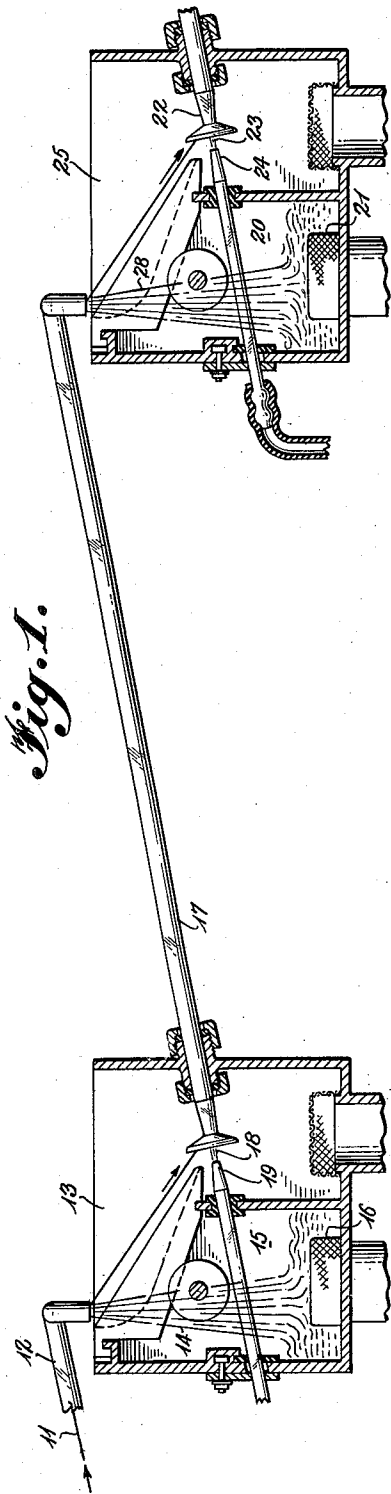
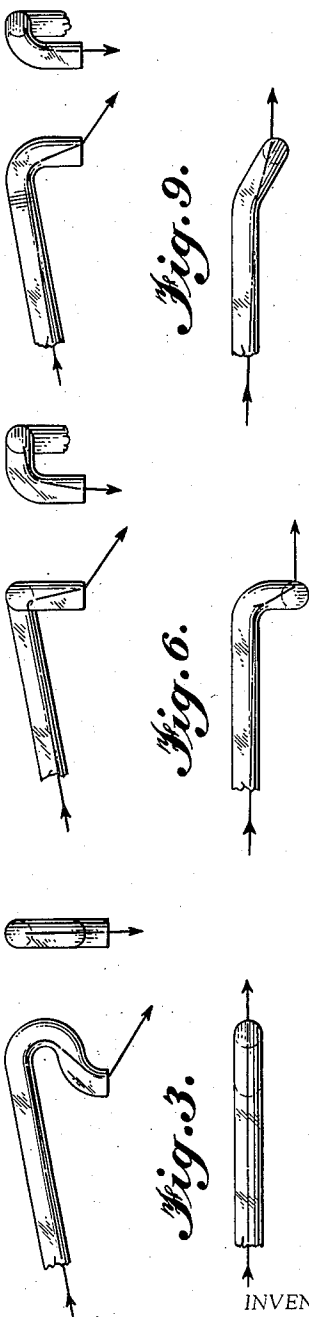


Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7. Fig. 8. Fig. 9. Fig. 10.



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## SPINNING TUBE

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Application February 20, 1953, Serial No. 337,929

10 Claims. (Cl. 8—151.2)

This application is a continuation-in-part of my co-pending application Serial No. 122,560, filed October 20, 1949 (now Patent No. 2,725,276), which in turn is a continuation-in-part of application Serial No. 91,253, filed May 4, 1949, now abandoned.

The present invention relates to the production of a filamentous material, such as threads, filaments, fibers, yarns and the like, hereinafter referred to generically as threads, and more particularly the invention is directed to the continuous after-treatment of freshly-spun synthetic threads wherein the amount of liquid carry-over from one treatment to the next is substantially reduced. In its more specific aspects, the invention relates to a method and apparatus for the continuous spinning of viscose rayon thread wherein the liquid carry-over in a continuous tube-spinning system is reduced when the thread passing from the exit end of one treating tube continues on to a subsequent processing apparatus in a substantially linear direction instead of reversing its path of travel.

At the present stage of development of the art of continuous spinning, it is recognized that the greatest commercial success has been achieved by those after-treating systems which involve the use of mechanical devices for storing and propelling the yarn while it is being subjected to the action of various after-treating liquids. Despite the commercial success of some of these systems, it has been recognized from the very first that the thread-storage, thread-advancing devices are inherently expensive to install and maintain, and impractical from the standpoint of storage requirement. Consequently, there has been much activity with a view to producing thread-storing, thread-advancing devices that are cheaper to build, easier to maintain, and susceptible of arrangements in various space-saving relationships.

Another and theoretically superior approach to the continuous spinning problem has been to devise an after-treating system in which thread-storage, thread-advancing devices are totally eliminated. In spite of theoretical superiority of a system in which mechanical thread-storage, thread-advancing devices are wholly eliminated, difficulties in threading-up such machines and maintaining adequate separation of the after-treating liquid used has thus far relegated most of the efforts to the state of further experimentation. One scheme has been developed which involves washing a freshly formed thread into a funnel leading to an elongated after-treating tube and then maintaining a constant head of liquid at the funnel to propel the treating liquid and the thread through the tube. This system results in subjecting the thread to an adequate after-treatment from the chemical point of view but the system is fraught with difficulties in respect to threading up and inherently limited in subjecting the thread to but a single after treatment, whereas much of the commercially accessible rayon is required to be washed, and in the case of viscose rayon, desulphurized, bleached and finished.

In application Serial No. 122,560, filed October 20,

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1949, of which this application is a continuation-in-part, there is described a system for propelling thread through tubes with treating liquids, the liquids being the sole force for motivating the thread. In that system each thread is passed through individual tubes which are so positioned that the thread upon emerging from the tube reverses or alters its direction to such an extent that the carry-over treating liquid is essentially minimized or eliminated.

The reversal in direction of the thread results in a substantial separation of thread and liquid. When the apparatus is so arranged that the thread after emerging from the treating tube continues along in the same linear direction as the liquid, the thread tends to carry a substantial amount of liquid unless special preventive measures are taken. The use of stripping guides between the tubes to aid liquid separation is undesirable in that the presence of such guides complicates the apparatus and tend to increase friction on the thread.

Should the threads upon emerging from a treating tube having a conventional right angle bend therein, such as shown in Figures 12 and 13 of application Ser. No. 122,560, be drawn off in a linear direction, the thread will pass across the flowing liquid in the vertical leg and tend to thus pick up a considerable amount of liquid which will be carried along with the moving thread.

The present invention is, therefore, concerned primarily with a method and apparatus for removing a substantial amount of liquid from the thread when upon its emergence from the tube the thread is drawn off in a direction linear to that of the thread path through the main body of the tube.

It is therefore an object of this invention to provide a process and apparatus for reducing the amount of carry-over liquid in a continuous tube-spinning system when the thread passing from the exit end of the treating tube continues in a substantially linear direction instead of reversing its path of travel.

Other objects and advantages of this invention will be apparent when considered in conjunction with the accompanying drawings; wherein:

Figure 1 is a view in side elevation of one section of an apparatus according to the present invention in which the after-treating tubes are arranged linearly;

Figure 2 is a side elevation view of one embodiment of the egress portion of the treating tube of this invention;

Figure 3 is a plan view of the exit end of the tube of Figure 2;

Figure 4 is an end elevation view of the exit end of the tube of Figure 2;

Figure 5 is a side elevation view of the exit end of another embodiment of the treating tube of this invention;

Figure 6 is a plan view of the exit end of the tube of Figure 5;

Figure 7 is an end elevation view of the tube of Figure 5;

Figure 8 is a side elevation view of the exit end of still another embodiment of the treating tube of this invention;

Figure 9 is a plan view of the exit end of the tube of Figure 8; and

Figure 10 is an end elevation view of the tube of Figure 8.

Referring first to the details of Figure 1, wherein the thread has already been spun-in, freshly-spun thread 11 during the course of treatment with various liquids is conveyed through tube 12 to treating station 13 by liquid 14. The liquid 14 upon emerging from tube 12 falls directly into compartment 15, where it can be recovered by any suitable means, as it is exhausted from

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drain 16. The thread 11, on the other hand, upon emerging from tube 12, is caused to pass directly to tube 17. As the thread 11 enters tube 17, it becomes entrained by the stream of liquid 18 issuing from jet 19 which is in alignment with tube 17. Liquid 18 then conveys the thread 11 through tube 17 to the next succeeding treating station 25 wherein the cycle is repeated. The liquid 18 upon emerging from tube 17 falls directly into compartment 20 where it is exhausted through drain 21. The thread 11 upon emerging from tube 17 is conveyed directly to tube 22, where it is entrained for further treatment by liquid 23 issuing from jet 24.

As can be seen from Figure 1, when the thread 11 emerges from the treating tube 12 and is drawn off in a linear direction, it tends to carry a substantial amount of treating liquid with it. Unless the liquid can be satisfactorily separated from the thread upon its emergence from the tube, the subsequent treating liquid will be contaminated with the preceding liquid and its effectiveness as a treating medium diminished.

Figures 2 to 10 are concerned with means for substantially completely separating the treating liquid from the thread upon its emergence from the tube. The exit end of treating tubes 12 and 17 in Figure 1 may have the structure of any of the three embodiments shown in Figures 2 to 10. It is apparent that the tubes actually shown in Figure 1 have the structure shown in Figures 5 to 7.

Figures 2 to 4 illustrate various views of one means for overcoming the foregoing disadvantages. Here, the exit end of the treating tube is formed into the shape of a gooseneck. It is seen that the thread upon emerging from the exit end of the tube in a linear direction does not pass across the path of liquid flow but instead adheres to the wall of the tube nearest the side at which it emerges from the tube. With this type of exit end on the tube a substantially improved liquid separation is obtained and the thread carries considerably less liquid with it.

In Figures 5 to 7 the treating tube is so constructed near its exit end that the thread passes through a right angle bend in the same plane as the treating tube proper and then immediately passes through another right angle bend into a vertical section of the treating tube from which it is withdrawn.

Figures 8 to 10 are a modified version of the treating tube shown in Figures 5 to 7. Here the first bend in the treating tube is approximately 30°. After passing through this bend, the thread is directed into the vertically disposed leg of the treating tube and withdrawn in a direction roughly parallel to the treating tube proper. It has been determined that if the 30° bend shown in Figures 8 to 10 is reduced appreciably, unsatisfactory liquid separation is obtained. For example, the treating tube as constructed in Figures 8 to 10 with a 10° bend was found to be completely unsatisfactory and in a tube with a bend of about 20° considerable amounts of liquid were intermittently carried over by the thread.

Although the treating tube constructed according to the present invention has been described as being of particular utility in a spinning system where the tubes are arranged linearly, it must be understood that such treating tubes have been found useful as the final treating tube in a continuous tube spinning system, for example, see Figure 14 of copending application Ser. No. 122,560. The tube structure of the present invention may also find use in the cross-over tube which conveys the thread from spinning position to the first treating tube when the apparatus is so arranged that the thread passes in a linear direction from the cross-over tube into the first treating tube in the cradle. This method of tube spinning through a series of linearly arranged tubes has also proven to be peculiarly adaptable in the production of tow yarn wherein a plurality of threads are passed through each treating tube. (See application Serial No.

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324,948, filed December 9, 1952, and assigned to the same assignee as the present application.) Since the tow tends to absorb and carry along a large amount of liquid from one treating tube to the next, the present invention is particularly useful in reducing the amount of liquid carried over by the tow.

What is claimed is:

1. In an apparatus for the treatment of continuous thread by the liquid propulsion of said thread through a tube, a treating tube substantially straight throughout most of its body portion, the exit end of which defines at least two bends aggregating a turn of greater than 90°, and means to withdraw the thread from said tube in a path divergent to the path of said liquid.

2. In an apparatus for the treatment of continuous thread by the liquid propulsion of said thread through a tube, a treating tube substantially straight throughout most of its body portion, the exit end of which defines two bends in the same plane, the bend around which the thread first passes being greater than 90°, and means to withdraw the thread from said tube in a path divergent to the path of said liquid.

3. In an apparatus for the treatment of continuous thread by the liquid propulsion of said thread through a tube, a treating tube substantially straight throughout most of its body portion, the exit end of which defines two bends in different planes, the first bend around which the thread passes being substantially 90° with the second bend at right angles to the plane defined by the said first bend, and means to withdraw the thread from said tube in a path divergent to the path of said liquid.

4. In apparatus for the treatment of continuous thread by the liquid propulsion of said thread through a tube, a treating tube, substantially straight throughout most of its body portion, the exit end of which defines two bends in different planes, the first bend around which the thread passes being at least 30° with the second bend at right angles to the plane defined by the said first bend, and means to withdraw the thread from said tube in a path divergent to the path of said liquid.

5. In an apparatus for the treatment of continuous thread by the liquid propulsion of said thread through a tube, a treating tube substantially straight throughout most of its body portion, the exit end of which defines two bends in different planes, the first bend around which the thread passes being 30° with the second bend at right angles to the plane defined by the said first bend, and means to withdraw the thread from said tube in a path divergent to the path of said liquid.

6. In a process for the liquid treatment of continuous thread, the steps of propelling the thread by a flowing liquid around a minimum of two bends at the exit end of a treating tube aggregating a turn of greater than 90° for both thread and liquid and simultaneously therewith passing the thread in contact with the exit end of said tube and then withdrawing the thread from said tube in a path divergent to the downward path of said liquid wherein a substantially improved liquid separation is obtained.

7. In a process for the liquid treatment of continuous thread, the steps of propelling the thread by a flowing liquid around two bends in the same plane in the exit end of a treating tube, the bend around which the thread first passes being of greater than 90°, to thereby contact the thread with the exit end of said tube and then withdrawing the thread from said tube in a path divergent to the downward path of said liquid wherein a substantially improved separation is obtained.

8. In a process for the liquid treatment of continuous thread, the steps of propelling the thread by a flowing liquid around two bends in different planes at the exit end of a treating tube, the first bend around which the thread passes being of substantially 90° with the second bend at right angles to the plane defined by the said first bend, to thereby contact the thread with the exit

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end of the said tube and then withdrawing the thread from said tube in a path divergent to the downward path of said liquid wherein a substantially improved liquid separation is obtained.

9. In a process for the liquid treatment of continuous thread, the steps of propelling the thread by a flowing liquid around two bends in different planes at the exit end of a treating tube, the first bend around which the thread passes being of at least 30° with the second bend at right angles to the plane defined by the said first bend, to thereby contact the thread with the exit end of said tube and then withdrawing the thread from said tube in a path divergent to the downward path of said liquid wherein a substantially improved liquid separation is obtained.

10. In a process for the liquid treatment of continuous thread, the steps of propelling the thread by a flowing liquid around two bends in different planes at the exit end of a treating tube, the first bend around which the thread passes being 30° with the second bend at right

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angles to the plane defined by the first bend, to thereby contact the thread with the exit end of said tube and then withdrawing the thread from said tube in a path divergent to the downward path of said liquid wherein a substantially improved liquid separation is obtained.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

|    |           |                |               |
|----|-----------|----------------|---------------|
| 10 | 1,033,925 | Palmer         | July 30, 1912 |
|    | 1,071,061 | Lacroix et al. | Aug. 26, 1913 |
|    | 1,403,126 | Lyth           | Jan. 10, 1922 |
|    | 2,313,006 | Ufnowski       | Mar. 2, 1943  |
|    | 2,360,352 | Lodge          | Oct. 17, 1944 |
| 15 | 2,371,579 | Cole et al.    | Mar. 13, 1945 |
|    | 2,712,977 | Keggin         | July 12, 1955 |
|    | 2,725,276 | Griset         | Nov. 29, 1955 |
|    | 2,725,277 | Rilling et al. | Nov. 29, 1955 |

##### FOREIGN PATENTS

|    |         |             |              |
|----|---------|-------------|--------------|
| 20 | 256,814 | Switzerland | Mar. 1, 1949 |
|----|---------|-------------|--------------|