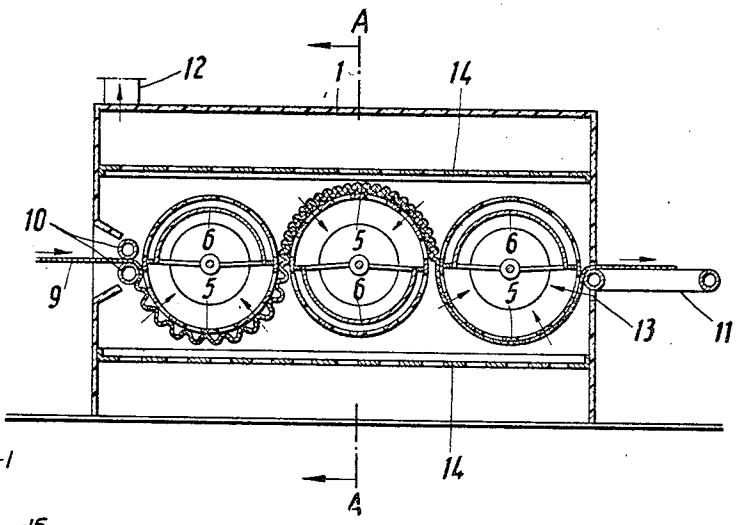
March 31, 1970 H. FLEISSNER 3,503,135

PROCESS AND APPARATUS FOR THE TREATMENT OF TEXTILE MATERIALS

Filed Jan. 23, 1968

Fig. 1



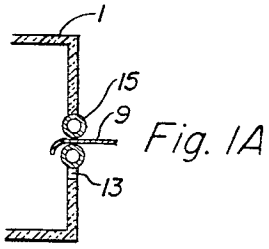
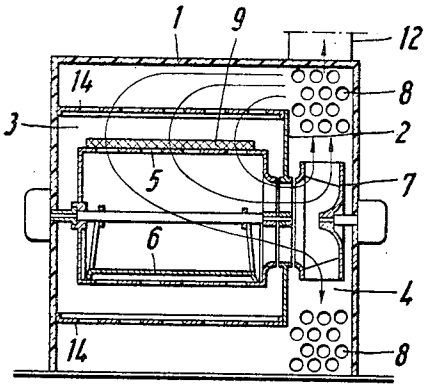


Fig. 1A

Fig. 2 (A-A)



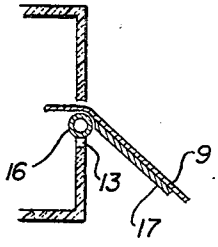


Fig. 1B

Inventor:
HEINZ FLEISSNER

BY: Craig & Antonelli
ATTORNEYS

United States Patent Office 3,503,135
Patented Mar. 31, 1970

3,503,135

PROCESS AND APPARATUS FOR THE TREATMENT OF TEXTILE MATERIALS

Heinz Fleissner, Frankfurt am Main, Germany, assignor to Anstalt fur Patentdienst, Vaduz, Liechtenstein

Filed Jan. 23, 1968, Ser. No. 699,932
Claims priority, application Germany, Jan. 28, 1967, A 54,741
Int. Cl. F26b 7/00
U.S. Cl. 34—12 28 Claims

ABSTRACT OF THE DISCLOSURE

The present disclosure is directed to a process for the treatment of textile materials which comprises introducing the material to be treated into the treatment chamber in a folded condition on the surface of at least one conveying means by overfeeding said material to said conveying means, said folds extending radially from the surface of said conveying means, and exposing said textile material to a treatment medium in the folded condition during only a part of the treatment process. The present invention is also concerned with the apparatus for conducting the recited process.

BACKGROUND OF THE INVENTION

The present invention relates to a process and apparatus for the treatment, especially for the wet-treatment and drying of textile materials such as threads, tow, slivers, top slivers and the like. The material being treated is guided in a folded condition in the treatment chamber and held to conveying elements, preferably perforated drums, by means of a treatment medium flowing from the outside to the inside of the drum. In the present invention the fibers of the textile material being treated are set during the treatment process, the textile material being in one and the same condition subjected to the treatment medium during only part of the drying time. The present process is also suitable for treating woven and knitted fabrics as well as for non-wovens. The present invention is also concerned with the apparatus for conducting the instant process.

In order to keep the treatment devices and the treatment chamber as small as possible, it is well known to introduce the textile material in a folded condition to the treatment process. It has been found that when considering treatments in which the fibers are set, for example in drying processes, the bending points in the fibers are set and cannot afterwards be completely removed. This results in an undesirable spinnability in the case of tow and top slivers. Woven and knitted fabrics and non-wovens cannot be treated, especially dried in a folded condition because hte bending portions of the textile becomes set.

It has been suggested to subject the textile material to a treatment process in a folded condition during only part of the treatment, for example during part of a drying process. Then, by refolding the material and/or by unfolding the material before final drying, the folds in the textile materials do not become fixed. It was determined that for sliver-type materials, such as tow and top, it was advantageous to fold the material by means of a folding device, zig-zag like, transversely to the direction of material passage onto the inlet conveying element, to unfold the material during drying and to fold the material again onto a drum. In this manner not only are the bending points of the tows and top slivers prevented from setting but also a more uniform drying was effected due to the rearrangement of the material. Generally, the tows and top slivers overlapped at the bending points where they were folded

zig-zag like and thus the material did not dry as well as when it was in a straight condition.

SUMMARY OF THE INVENTION

An object of the present invention is to avoid the prior art disadvantages in the treatment of textile materials, for example drying textile materials such as threads, tows, slivers, top slivers and the like.

Another object of the present invention is to provide an improved process and apparatus for drying textile materials wherein uniform drying is effected on a small amount of floor space without having the bending points and/or folds of the material being treated fixed during the treatment process.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Pursuant to the present invention it has been found that the above-disadvantages may be eliminated and a much improved process and apparatus for the treatment of textile materials, for example the drying of textile materials can be obtained by overfeeding the textile material to conveying means and by holding and guiding said material on the surface of said conveying means, for example sieve drum means, in folds which project radially from the surface of the conveying means and/or the sieve drum means. By overfeeding the textile materials, such as tow and top slivers, to the conveying means, said materials are opened and thus become more permeable to air. However, above all, it is now possible to treat woven and knitted fabrics and non-wovens in a folded condition.

Tests have shown that for a uniform drying it is advantageous to overfeed the textile material gradually, that is to overfeed the material several times when passing it from one conveying means to another conveying means and/or to unfold it gradually by means of further conveying means.

At relatively high treatment temperatures, for example drying temperatures, a rather pronounced fixation of the bending points or folds is encountered. In this situation it is advantageous to tension the textile material when unfolding it, especially on the last sieve drum means. In this way an ironing effect can be obtained which ensures a smoothening of the folds or bending points. Tests have shown that when folding the material by overfeeding it wherein the folds extend radially from the surface of the conveying means, the bending points are substantially less pronounced than when folding the textile material in a zig-zag manner transversely to the direction of material passage.

For carrying out the process according to the present invention it is suggested to use as the conveying means sieve drums subjected to a suction draft. The speed of the inlet conveying means and/or the first sieve drum means is generally many times higher than that of the subsequent sieve drum means and frequently at least one subsequent sieve drum means runs at the same conveying speed as the inlet conveying means. If the textile material being treated shrinks during drying, the conveying speed of the subsequent sieve drum means can be reduced according to the degree of shrinkage.

An unfolding of the material which has been folded by gradual overfeeding to the apparatus is obtained if at least two conveying means, for example two sieve drums or one sieve drum and one discharge conveying means run at a speed which is many times higher than that of the

preceding conveying means. Also, the last conveying means can run at approximately the same speed as the inlet conveying means. If a desired ironing effect is to be obtained, the last sieve drum means is driven at a higher speed than the inlet conveying means. In this manner the textile material rests on the sieve drum means with a preliminary tension and is dried in this condition and, above all, is cooled down in the stretched condition by cooling air which is flowing countercurrent to the direction of conveyance. By cooling down the textile material, it is frozen in the stretched condition.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only and thus are not limitative of the present invention and wherein

FIGURE 1 is a longitudinal sectional view of the apparatus according to the present invention;

FIGURE 1A shows a modification of the discharge end of the apparatus;

FIGURE 1B shows another modification of the discharge end of the apparatus; and

FIGURE 2 is a cross sectional view of the apparatus according to FIGURE 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, the apparatus of the present invention comprises a heat-insulated housing **1** which is subdivided by a partition means **2** into a treatment chamber **3** and into a fan chamber **4**. In the treatment chamber **3**, three sieve drums **5** subjected to a suction draft are arranged. The suction draft is interrupted as those portions of the sieve drum means which are not covered with the material being treated by a baffle **6**. A radial fan wheel **7** is disposed in the fan chamber **4** and heater batteries **8** correlated to each sieve drum are disposed above and beneath the fan wheel.

As a result of the fan wheel **7** the treatment medium, for example the drying air, is drawn out of the sieve drum **5** at its face and is recirculated via the upper and lower heater batteries **8** into the treatment chamber **3**. At this portion of the sieve drum the treatment medium is drawn in by the sieve drums subjected to a suction draft, and in so doing the treatment medium penetrates the textile material **9**.

At the inlet of the apparatus a pair of rollers **10** are arranged, by which the textile material is overfed to the first sieve drum **5** so that it forms folds which extend radially on the sieve drum. Another overfeeding can be effected between the first and the second sieve drum **5**. The last sieve drum operates at such a high speed that the textile material **9** rests on the sieve drum in a stretched condition. Subsequently, the textile material is passed onto a conveyor belt **11** at the discharge end of the apparatus where it is transported out of the treatment chamber **3**. Instead of a conveyor belt **11** a pair of rollers **15** or a deflector roller **16** and/or a chute **17** may also be provided. A conveyor belt with a roller correlated to it or only a conveyor belt may also be used instead of a pair of inlet rollers **10**. At the discharge end of the apparatus fresh air is drawn in through a slit **13** at that portion of the drum which is covered with the material being treated. Thus, the textile material **9** is cooled down and set in this stretched condition. The air enriched with moisture is discharged in a well known way at the inlet of the apparatus above the fan chamber through an air discharge socket **12**. Generally sieve sheets **14** are provided above and beneath the sieve drums for equalizing the flow conditions.

The present invention is also feasible using any number of drums. In the case of a drier with two sieve drums, it is advantageous to treat the textile material on the first sieve drum in a folded condition and on the second sieve drum in a stretched condition. In the case of a drier with only one sieve drum it is expedient to fold the textile material onto the sieve drum by means of a pair of rollers and to unfold the textile material by means of a corresponding tensile stress and a pair of draw-off rollers before it is cooled down by the fresh air which is drawn into the apparatus. If more than three sieve drums are used, it is generally sufficient if the textile material is guided in a stretched condition on the last sieve drum or on the last two sieve drums. If the textile material is guided in a stretched condition on two drums, it is advantageous if the textile material is tensioned on the last sieve drum whereas on the penultimate sieve drum it may be guided without any tension.

The present invention is also suited for the treatment of yarn which is, for example guided from warp beam to warp beam. However, it is also possible to feed the wound up yarn in any desired number of threads by means of a bobbin creel and to wind it up again after the continuous treatment.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications are intended to be included within the scope of the following claims.

It is claimed:

1. A process for the treatment of textile materials which comprises introducing the material to be treated into a treatment chamber in a folded condition on the surface of at least one conveying means subjected to a suction draft by overfeeding said material to said conveying means, said folds extending substantially radially from the surface of said conveying means, drawing a heated treatment medium through said material while in the folded condition, unfolding said material while it is being conveyed, drawing a heated treatment medium through said material in the unfolded condition and cooling the material in the unfolded condition by drawing a cooling medium through said material before it is removed from said conveying means.

2. The process of claim **1**, wherein more than one conveying means is utilized and overfeeding of the textile material is effected gradually to the first conveying means and at the point of passage between conveying means, and unfolding of the material is gradually effected in the same manner by subsequent conveying means.

3. The process of claim **2**, wherein during unfolding the textile material is tensioned.

4. The process of claim **3**, wherein the textile material is cooled in the tensioned or stretched condition.

5. The process of claim **2**, wherein folding and unfolding of the textile material is effected by increasing and decreasing the speed of rotation of the conveying means.

6. The process of claim **1**, wherein the textile materials are woven and knitted fabrics and non-wovens.

7. The process of claim **1**, wherein the conveying means are sieve drum means and the textile material is held to the surface of the sieve drum means by a suction draft.

8. A process for drying textile materials on the surface of more than one sieve drum means subjected to a suction draft which comprises introducing the material to be treated in a folded condition on the surface of the sieve drums by gradually overfeeding said material to the first sieve drum and to subsequent sieve drums when passing it from one sieve drum to the next sieve drum, and gradually unfolding the textile material by conveying said material on the surface of sieve drum means rotating at a faster speed than the preceding sieve drum means.

9. The process of claim 8, wherein the folds extend radially from the surface of the sieve drum means and the treatment medium is drawn through the textile material.

10. The process of claim 8, wherein folding is achieved by introducing the material to the sieve drum means at a rate faster than the rotation of said sieve drum means.

11. The process of claim 8, wherein during unfolding, the textile material is tensioned by rotating at least the last sieve drum means at a speed higher than the rate of introduction of said material, thereby prroducing an ironing effect.

12. The process of claim 11, wherein the textile material is cooled down in the stretched condition by cooling air which is flowing countercurrent to the direction of conveyance.

13. The process of claim 8, wherein at least the last sieve drum means rotates at a higher speed than the preceding conveying means.

14. The process of claim 8, wherein at least the last sieve drum means rotates at about the same speed as the inlet conveying means.

15. The process of claim 8, wherein the last sieve drum means rotates at a speed in accordance with the degree of shrinkage of the textile material.

16. The process of claim 8, wherein the rotation of the sieve drum means is infinitely variable.

17. An apparatus for the treatment of textile materials which comprises a heat-insulated housing, at least one sieve drum means subjected to a suction draft rotatably disposed within said housing, inlet means for introducing the material to be treated to the first sieve drum means in the housing and outlet means for removing the material from the housing, said housing being provided with an opening below the outlet means, said opening being adjacent to that portion of the last sieve drum means which is covered with the material being treated for the introduction of cooling air which flows countercurrent to the direction of material passage, said housing also being provided with a discharge socket above the inlet means to the housing.

18. The apparatus of claim 17, wherein the heat-insulated housing is subdivided by a partition means into a treatment chamber and a fan chamber, and the discharge socket is disposed above said fan chamber at the inlet portion of the housing.

19. The apparatus of claim 18, wherein the inlet means is a pair of rollers and the outlet means is a conveyor belt.

20. The apparatust of claim 19, wherein the outlet means is a pair of rollers.

21. The apparatus of claim 19, wherein the outlet means is a deflector roller.

22. The apparatus of claim 19, wherein the outlet means is a chute.

23. The apparatus of claim 17, wherein sieve sheets are provided above and below the sieve drum means to equalize the flow conditions in the housing.

24. The apparatus of claim 17, wherein the speed of rotation of the inlet means is faster than the following sieve drum means.

25. The apparatus of claim 24, wherein the speed of rotation of the first sieve drum means is faster than subsequent sieve drum means.

26. The apparatus of claim 25, wherein the speed of rotation of at least the last sieve drum means is about the same conveying speed as the inlet means.

27. The apparatus of claim 25, wherein the speed of rotation of at least the last sieve drum means is higher than the preceding sieve drum means.

28. The apparatus of claim 25, wherein the speed of rotation of at least the last sieve drum means is higher than the inlet conveying means.

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FREDERICK L. MATTESON, JR., Primary Examiner

H. B. RAMEY, Assistant Examiner

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