United States Patent [19]

Fleissner

[11] **3,728,076**

[45] **Apr. 17, 1973**

[54] **PROCESS FOR THE HEAT-SETTING OF PADDED AND PRINTED ENDLESS SYNTHETIC FILAMENT GROUPS AND TOP SLIVERS**

[75] Inventor: **Heinz Fleissner,** Egelsbach near Frankfurt Main, Germany

[73] Assignee: **Vepa AG,** Basel/Schweiz, Germany

[22] Filed: **Feb. 6, 1970**

[21] Appl. No.: **9,386**

Related U.S. Application Data

[63] Continuation-in-part of Ser. Nos. 676,780, Oct. 20, 1967, and Ser. No. 786,042, Dec. 23, 1968, Pat. No. 3,533,145.

[30] **Foreign Application Priority Data**

Feb. 6, 1969 Germany.....P 19 730.8

[52] **U.S. Cl.** .....**8/149.1,** 8/149.3, 8/151.2, 68/5 D, 68/DIG. 5

[51] **Int. Cl.**.....**D06c 1/08**

[58] **Field of Search**.....68/5 D, 9, 5 E, DIG. 5; 8/149.1, 149.3, 151, 151.2, 21, 176; 28/1.6

[56] **References Cited**

UNITED STATES PATENTS

3,028,682	4/1962	Fleissner	68/DIG. 5
3,288,551	11/1966	Raff	8/21
3,011,266	12/1961	Fleissner	68/DIG. 5
3,242,702	3/1966	Fleissner	68/5 D
2,139,017	12/1938	Heberlein	8/151.2 X
3,137,056	6/1964	McClure et al.	8/151.2 X
2,663,612	12/1953	Gibson	8/176 X

FOREIGN PATENTS OR APPLICATIONS

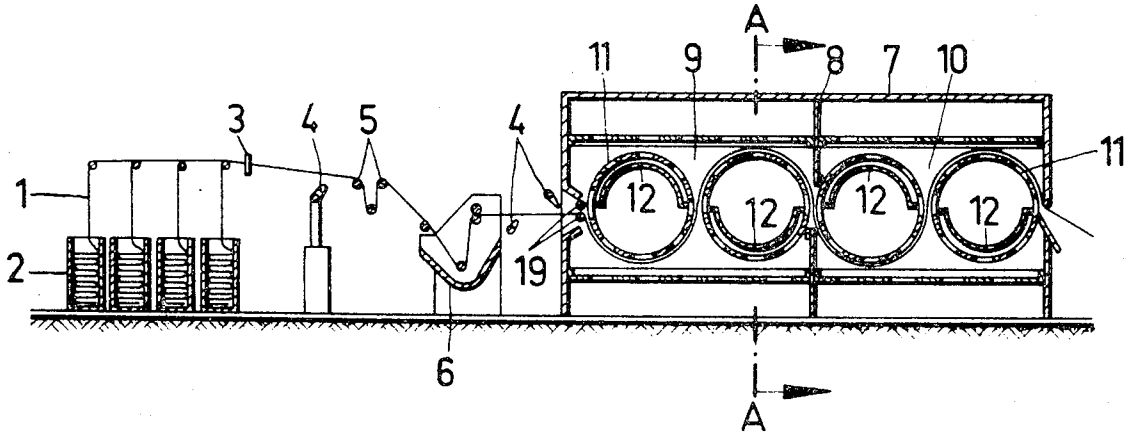
1,151,317	5/1969	Great Britain	68/DIG. 5

Primary Examiner—William I. Price
Assistant Examiner—Philip R. Coe
Attorney—Craig, Antonelli, Stewart & Hill

[57] **ABSTRACT**

The present disclosure is directed to a process for the continuous pad-dyeing or printing of continuous synthetic filament groups with dyestuffs which set under the influence of heat which comprises padding or printing synthetic filament groups with a treatment liquor containing dyestuffs and other auxiliary agents and passing steam which has been superheated to a temperature of about 170° to 230°C through the filament groups.

11 Claims, 3 Drawing Figures



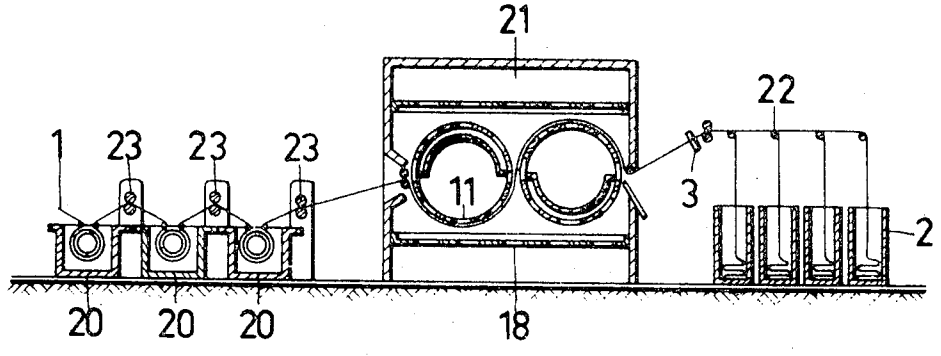


Fig.1a

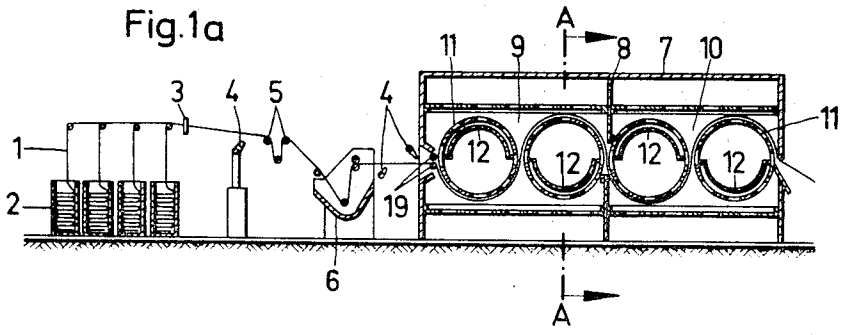


Fig.1b

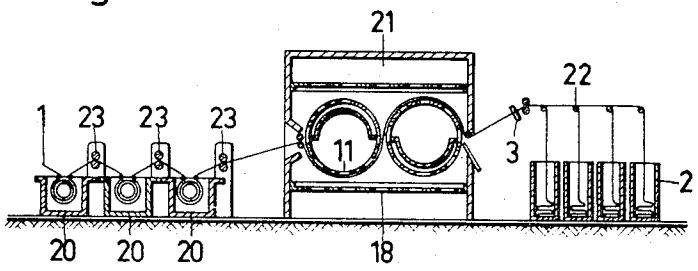
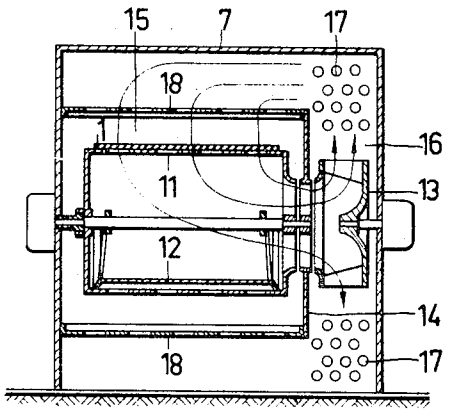


Fig.2
A-A



Inventor:
HEINZ FLEISSNER

BY: Craig, Antonelli, Stewart & Hill
ATTORNEYS

PROCESS FOR THE HEAT-SETTING OF PADDED AND PRINTED ENDLESS SYNTHETIC FILAMENT GROUPS AND TOP SLIVERS

The present application is a continuation-in-part of applications Ser. Nos. 676,780 and 786,042 now U.S. Pat. No. 3,533,145 filed Oct. 20, 1967 and Dec. 23, 1968, respectively.

BACKGROUND OF THE INVENTION

The present invention relates to a process for the continuous pad-dyeing and/or printing of endless synthetic filament groups, e.g. tows and slivers of synthetic staple fibers with dye-stuffs which set under the influence of heat. According to U.S. Pat. application Ser. No. 676,780, a gas, which has been heated to a temperature of about 170° to 230°C., is passed through filament groups or top slivers which have been printed or padded with preparations containing the aforementioned dyestuffs and possibly thickeners and other auxiliary agents. Said filament groups or top slivers can also be dried.

SUMMARY OF THE INVENTION

An object of the present invention is to avoid the prior art disadvantages in the dyeing of continuous synthetic filament groups and top slivers with dyestuffs which set under the influence of heat.

Another object of the present invention is to provide an improved process for continuously dyeing synthetic filament groups and top slivers wherein uniform setting of the fiber and the crimp is achieved.

A further object of the present invention is to provide an improved process for continuously dyeing and setting synthetic filament groups and top slivers wherein an increased brightness and a better rub-fastness of the colors is achieved.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it would 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.

The parent applications describe a process and an apparatus for the heat-setting of padded and printed endless synthetic filament groups. This process is also called the Thermosol process. As stated in the parent applications, a very uniform dyeing is obtained if a heated gas is passed through the filament groups, tows or top slivers. Normally this gas is heated air. However, tests have led to the quite unexpected result that especially the crimp of the tows is much better maintained if superheated steam is used instead of air as the treatment medium. At the same time it has been found that equivalent setting effects are obtained with both media even though the steam temperature is 20°C. lower than the air temperature.

With disperse dyestuffs, for instance, the setting produced by the steam results in increased brightness and in a better rubbing-fastness of the colors. This can be explained mainly by the fact that it is easier to remove the auxiliary agents and thickeners in the subsequent washing process if steam is used for the setting

process. Therefore, it is suggested to use superheated steam as the setting medium. Most advantageous for Thermosol-setting is a steam temperature of about 200°C.

Tests have shown that an optimum crimp of the filament groups is obtained and maintained if these filament groups are dried and heated to the setting temperature on sieve drums which are subject to a suction draft and if they are permitted to rest for a certain time on the conveying means onto which they are discharged from the drums. The filament groups are transferred to the conveying means while still in the hot state and are permitted to dwell for a period of about 5 to 40 seconds in the same steam atmosphere that prevailed during the setting stage of the process.

Here it is particularly advantageous to overfeed the tows, radially, on the sieve drums which are subject to a suction draft during the driving and the heating processes. This permits an absolutely tensionless shrinking of the synthetic filament groups during the two processes. The radial overfeed is established to be higher than the shrinking capacity of the synthetic filament groups during the heat-setting process.

It is also expedient to cool down the filament groups, shock-like, after the setting process, before they are taken off the conveying or the sieve drum. This cooling-down process can be effected by pouring cold water on the filament groups. On the other hand it is also possible to pass ambient air through the filament groups which rest on the conveying means in thick layers. The conveying means is generally a wire mesh belt.

The materials which can be treated by the process and apparatus of the present invention include any of the synthetic filaments or blends of synthetic filaments with other synthetic filaments or cellulose filaments. The synthetic fibers may comprise synthetic polymers such as polyolefins, e.g., polyethylene, polypropylene, etc., polyamides, e.g. Nylon 6 obtained by the condensation of caprolactam, Nylon 66 obtained by the condensation of hexamethylenediamine with adipic acid, etc., polyesters, e.g., polyethylene terephthalate, etc., phenolic resins, e.g., phenol formaldehyde resins, urea formaldehyde resins, etc., polyvinyl materials, e.g., polyvinyl chloride, polyvinyl acetate, etc., acrylate resins, e.g. polymethylmethacrylate, copolymers of these materials with one another or with ethylenically unsaturated monomers, and similar type polymers. The present invention is particularly applicable to polyester fibers or blends of polyester fibers with, for example cellulose fibers.

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

FIGS. 1*a* and 1*b* show a schematic design of a continuous dyeing plant for processing top slivers and tow; and

FIG. 2 is a section of the sieve drum device according to the apparatus of FIG. 1 taken along the line A—A of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings wherein like reference numerals are used through the various views to designate like parts, the apparatus of the present invention comprises several tows **1** which are packed into cans **2**, arranged in parallel by means of a rake-like element **3** and spread by means of a blowing device **4** and a spreading device **5** to form a thin material layer of uniform thickness. In many cases the use of a blowing device **4** or a mechanically operating spreading device **5** is sufficient for spreading the tows. The tows **1** are then fed to a padder **6**, impregnated, for example with disperse dyestuffs and auxiliary agents and then fed to a sieve drum treatment plant **7**. This plant is subdivided by a partition **8** into a drying chamber **9** and a setting chamber **10**. Both chambers are equipped with sieve drums **11** subjected to a suction draft. The suction draft is interrupted at that portion of the sieve drums which are not covered with the material being treated by means of a baffle **12** so that the treatment medium, preferably superheated steam, is drawn through the material more intensely. A fan **13** is correlated to the face of each other by means of a partition **14** which subdivides the drying chamber **9** and the setting chamber **10** respectively into a treatment chamber **15** and a fan chamber **16**. Above and beneath the fan means **13** heater batteries **17** are arranged for heating up the circulated treatment medium. For equalizing the air current, sieve sheets **18** are provided above and beneath the sieve drums. At the inlet of the sieve drum treatment plant **7** a pair of rollers **19** is arranged, the speed of which can be infinitely adjusted with respect to the feed of the sieve drums **11** so that the tows can be overfed to a desired degree to the first sieve drum. Generally the degree of overfeeding corresponds to the degree of material shrinkage during the treatment and/or the degree of shrinkage on the first sieve drum. By a gradation of the speeds of the individual sieve drums, the tows are pushed together and thus they are allowed to shrink again on the following sieve drum. By providing a large enough overfeeding a substantially tensionless material guidance on the sieve drums **12** subjected to a suction draft and full shrinkage of the material during the treatment is ensured. In this manner it is also possible to handle texturized tows properly without the texture being adversely affected. As previously stated, the tows and top slivers are treated, that is dried and/or set with steam. Advantageously, a conveyor belt (not shown), at least a portion of which extends into the setting chamber, can be used to remove the textile material from the sieve drum means. Thus the material is permitted to dwell for a time in the same steam atmosphere that prevailed during the setting stage of the process.

For washing out the unfixed dyestuffs and auxiliary agents suction drum bowls **20** are provided and the material is subsequently dried on a sieve drum dryer **21** which is of the same design as the sieve drum treatment plant **7**. After drying, the material length is again separated by means of a rake-like element **3** to form the individual top slivers and/or tows which are packed into cans **2** by means of a suitable packing device which in the drawing is only shown schematically by rolls **22**. It is also possible to arrange conveyor belts between the individual units and between the suction drum bowl **20** and the squeezer **23** if a tensionless material guidance is also desired in this part of the treatment process.

What is claimed is:

1. A process for the continuous pad-dyeing or printing of continuous synthetic filament groups with dyestuffs which set under the influence of heat which comprises padding or printing synthetic filament groups with a treatment liquor containing dyestuffs and other auxiliary agents, conveying said filament groups impregnated with said dyestuffs and other auxiliary agents over a perforated surface of sieve drum means subjected to a suction draft, drying the filament groups with superheated steam and heating the filament groups to the setting temperature of said dyestuffs on said perforated surface by drawing steam which has been superheated to a temperature of about 170° to 230°C. through the filament groups and said perforated surface.

2. The process of claim **1**, wherein the synthetic filament groups are tows or slivers of synthetic staple fibers.

3. The process of claim **1**, wherein the filament groups are permitted to dwell for a period of about **5** to **40** seconds in the same steam atmosphere that prevailed during the setting of said dyestuff.

4. The process of claim **3**, wherein the synthetic filament groups are cooled down, shock-like, by being contacted with water after the setting of said dyestuff.

5. The process of claim **1**, wherein the synthetic filament groups are radially overfed on the sieve drum means which are subjected to a suction draft, at least during the drying of said filament groups and during the heating-up of the filament groups to the setting temperature of said dyestuffs.

6. The process of claim **1**, wherein a plurality of rope-like continuous filament groups are arranged in substantial parallel relationship with respect to each other to form a material length of uniform thickness, said material length being padded or printed, dried and Thermosol dyed and subsequently washed and dried in one continuous process.

7. The process of claim **1**, wherein the continuous synthetic filament groups are initially spread to form a thin layer of uniform thickness before being padded or printed.

8. The process of claim **1**, wherein the superheated steam temperature is 200°C.

9. A process for the continuous pad-dyeing or printing of continuous synthetic filament groups in the form of tows or slivers of synthetic staple fibers which comprises impregnating the filament groups with disperse dyestuffs, conveying said impregnated filament groups on a perforated surface of at least one sieve drum means, drying the filament group with superheated steam and setting the dyestuffs on the filament groups with superheated steam by drawing superheated steam which has been heated to a temperature of about 170° to 230°C. through said filament groups and through said perforated surface, washing out the unfixed dyestuffs and auxiliary agents and drying the dyed filament groups.

10. The process of claim **9**, wherein before impregnation the filament groups are arranged in substantial parallel relationship and spread to form a thin

material layer of uniform thickness, and after final drying the material length is again separated to form individual filaments which are packed into suitable containers.

11. The process of claim 9, wherein drying of said filament groups and setting of the dyestuffs on the filament groups are effected on several sieve drums arranged one behind the other, said filament groups being conveyed alternately on the surface of said sieve drums.

* * * * *