PROCESS FOR CRIMPING A TOW OF VINYL ALCOHOL POLYMER

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By

Attorneys
A process for crimping a tow of vinyl alcohol polymer, comprising the following steps: applying water containing at least 2% and at most equal to the degree of sorption to the tow; humidifying the tow at a temperature of 70° C. to 150° C. and a relative humidity of at least 80%; contacting the tow with a liquid of at least 80° C. and at most 150° C. for the time necessary to promote swelling; and compressing the tow at a temperature less than 80° C. to 150° C. and a relative humidity of at least 80% with a roller of the compression chamber. The crimping process is carried out in a heated chamber containing a mixture of air and steam, with the temperature and degree of humidity controlled to optimize the crimping. The process is particularly advantageous for maintaining high productivity and quality in the production of vinyl alcohol polymer.
8,316,611

cold water. Its residence time in this zone is 45 seconds.

The tow obtained has the following characteristics:

<table>
<thead>
<tr>
<th>Percent</th>
<th>Initial crimp (F₀)</th>
<th>Residual crimp after decrimping (F₁)</th>
<th>F₁/F₀ = 0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>10</td>
<td></td>
<td></td>
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</table>

The degree of crimp were determined under the conditions indicated by BISFA (Bureau International de Standardisation des Fibres Artificielles et Synthétiques) in the pamphlet published by this body in 1956.

The formula applied is:

\[
\text{Degree of crimp} = \frac{L_2 - L_1}{L_2} \times 100
\]

in which

- \(L_1\) = length of the cramped fibre (determined under a tension equal to the weight of 5 m. of the fibre)
- \(L_2\) = length of the decrimped fibre (i.e., the length after application of a tension corresponding to the weight of 1000 m. of the fibre).

The formula is applied as such for the determination of \(F_0\) (initial crimp).

The residual crimp after decrimping (\(F_1\)) is determined by replacing \(L_1\) in the above formula by \(L_1'\), being the length to which the fibre returns when again subjected to a tension equal to the weight of 5 m. of the fibre after the measurement of \(L_2\).

**Example II**

The same treatments as in Example I are applied to a tow of 352,000 dtex (320,000 denier), but under the following conditions:

- Temperature of the water: \(93^\circ\) C
- Duration of passage (residence time): seconds
- Length of the body of water: m
- Distance of the tow from the surface of the water: cm
- Speed in the crimping apparatus: m per minute
- Temperature of the heating rollers: \(130^\circ\) C
- Cooling time: seconds

The tow obtained has the following characteristics:

<table>
<thead>
<tr>
<th>Percent</th>
<th>Initial crimp (F₀)</th>
<th>Residual crimp after decrimping (F₁)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.4</td>
<td>8.1</td>
<td></td>
</tr>
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We claim:

1. Process for the continuous production of crimped tows consisting of filaments of vinyl alcohol polymers, which comprises simultaneously humidifying the tow and raising its temperature to between 70° and 100° C, by contacting it with water vapour free from droplets of liquid water whereby the tow acquires a degree of humidity at least 2% and at most equal to the degree of sorption, immediately thereafter mechanically crimping the tow at a temperature of 80°—150° C, in a heated compression chamber, and then cooling the tow while it is still in a compressed state.

2. Process according to claim 1, wherein a tow of continuous filaments is crimped.

3. Process according to claim 1, wherein a tow of discontinuous filaments is crimped.

4. Process according to claim 1, wherein the tow is humidified and heated by passing it through a space above the surface of a body of water which is at a temperature of 80°—100° C.

5. Process according to claim 1, wherein the tow is humidified and heated by passing it through a heated chamber containing a mixture of water vapour and air in predetermined proportions.

6. Process according to claim 5, wherein the heated chamber contains air of relatively humidity approximately 80% and at a temperature of approximately 90° C.

7. Process according to claim 1, wherein the tow is subjected to the humidifying conditions for at least 2.5 seconds.

8. Process according to claim 4 wherein the tow is subjected to the humidifying conditions for at least 2.5 seconds.

9. Process according to claim 6, wherein the tow is subjected to the humidifying conditions for at least 2.5 seconds.

10. Process according to claim 1, wherein in the crimping operation the humidifier tow is forwarded by rollers heated to a temperature of 80°—150° C.

11. Process according to claim 8, wherein in the crimping operation the humidifier tow is forwarded by rollers heated to a temperature of 80°—150° C.

12. Process according to claim 9, wherein in the crimping operation the humidifier tow is forwarded by rollers heated to a temperature of 80°—150° C.

13. Process according to claim 1, wherein the tow is cooled to below 50° C while still in a compressed state.

**References Cited by the Examiner**

**UNITED STATES PATENTS**

<table>
<thead>
<tr>
<th>Number</th>
<th>Date</th>
<th>Inventor</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,575,781</td>
<td>11/1951</td>
<td>Barsh ---</td>
<td>19-66</td>
</tr>
<tr>
<td>2,575,839</td>
<td>11/1951</td>
<td>Rainard ---</td>
<td>19-66</td>
</tr>
<tr>
<td>2,041,705</td>
<td>7/1962</td>
<td>Sonnino ---</td>
<td>28-1</td>
</tr>
<tr>
<td>3,111,740</td>
<td>11/1963</td>
<td>Stanley ---</td>
<td>28-1</td>
</tr>
<tr>
<td>3,152,379</td>
<td>10/1964</td>
<td>Oban ---</td>
<td>28-1</td>
</tr>
<tr>
<td>3,174,208</td>
<td>3/1965</td>
<td>Eaito et al. ---</td>
<td>28-72</td>
</tr>
</tbody>
</table>

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