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54 **Filamentary tow.**

57 A process for producing a tow of flat synthetic filaments comprising providing an unset low crimp filament tow, optionally transferring the tow to another site for further processing, and subjecting the tow to heat and tension which substantially removes all of the crimp from the filaments forming the tow.

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## FILAMENTARY TOW

This invention relates to the production of a continuous tow of flat synthetic filaments and to products produced therefrom.

According to the present invention we provide a process for producing a tow of flat synthetic filaments comprising providing an unset low crimp filament tow, optionally transferring the tow to another site for further processing, and subjecting the tow to heat and tension which substantially removes all of the crimp from the filaments forming the tow.

Whilst the filaments in the final tow can for all intents and purposes be described as 'flat' it should be understood that they may not be strictly planar (as with conventional flat yarn) as they may exhibit a slight surface unevenness. Nevertheless the filaments in the final tow exhibit all of the properties required of flat filamentary yarn in the production of nonwoven fabrics.

Recently there has been a desire to produce an uncrimped (flat) yarn for a variety of end uses. However it is very difficult to handle and package a tow of flat filaments which necessarily has to be done, particularly if the subsequent processing of the tow is to be carried out at a different site to where the tow is produced. We have now found that a tow can be handled and packaged without difficulty if an unset crimp is temporarily imparted to the filaments in the tow, such unset crimp subsequently being removed at some suitable stage in the processing chain.

The tow produced in the process of the invention is produced in a conventional manner and is then subjected to a conventional crimping operation by, for example, passing the tow through a stuffer box crimper.

The process of the invention may be carried out with any of the usual fibrous forming polymeric materials which may be produced in the form of a tow such as polyethylene terephthalate, polyamide, polypropylene and polyacrylics. Furthermore the process can be carried out with tows made from any of the usual bicomponent fibres known in the art to be useful in the production of nonwoven fabrics.

According to one aspect of the present invention we provide a process for producing short length synthetic flat fibres comprising providing an unset low crimp filament tow, optionally transferring the tow to another site for further processing, subjecting the tow to a drawing operation which substantially removes the crimp from the filaments forming the tow and cutting the filaments in the tow into the desired short lengths.

We have found that this aspect of the invention may be achieved satisfactorily if the filaments forming the tow are provided with an unset crimp of the order of 2 crimps per crimped centimetre (cpcc) and a crimp ratio of approximately 10%.

Before cutting the filaments in the tow to the desired short lengths using, for example, a Lummus cutter, it is necessary to remove the crimp from the filaments by subjecting the tow to a suitable drawing operation. Conveniently this is achieved by continuously passing the tow first through a set of rotating feed rolls and then through a set of rotating draw rolls in, for example, a steam chamber, the draw rolls rotating at a slightly higher speed than the feed rolls in order that the tow is drawn.

This aspect of the invention will now be described with reference to the following Example.

### EXAMPLE

A conventionally made 3.3 decitex/67 Ktex crimped unset nylon 6.6 core, nylon 6 sheath, bicomponent fibre continuous filament tow having a cpcc of 2.1 and a crimp ratio of 9% produced in a conventional manner was transported to another site for further processing.

At this new site, removal of the tow was effected without tangling.

The tow was subjected to a drawing operation. This involved taking the unset low crimp filament tow out of the box and feeding it into the feed roll zone of the drawframe. The drawframe consisted of 7 rolls in both feed and draw sections with a steam chamber in the draw zone.

The conditions used were 50 m/min draw speed using a draw ratio of 1.25. The latter combined with the steam treatment effectively straightened the tow filaments. The tow was then passed through a Lummus cutter and the filaments in the tow were cut into 13 mm length fibre.

Alternatively the straightened tow could have been wound onto a beam for storage prior to cutting.

According to another aspect of the present invention we provide a process for producing a slickened filamentary tow comprising providing an unset low crimp filament tow, applying an emulsion of a slickening agent to the tow, passing the coated tow through an oven at such a temperature and under such tension that (1) the coating is dried and the slickener cured, and (2) the crimp is substantially removed from the filaments forming the tow.

Optionally after the unset low crimp filament

tow has been produced it may be packaged and transferred to some other site for further processing.

We have found for this aspect of the invention that the process of the invention may be achieved satisfactorily if the filaments forming the tow are provided with an unset crimp of the order of 8.5 crimps per crimped centimetre (cpcc) and a crimp ratio of approximately 25%.

Typically the slickening agent used in the process of the invention will be a silicone based polymer such as a polysiloxane. However the use of other suitable slickening agents is not precluded. The slickening agent may be applied to the tow as an emulsion in, for example, water in any suitable manner for example by immersing the tow in a bath containing the emulsion.

The tow is then passed through an oven in order to dry the tow and cure the slickening agent on to the surface of the filaments in the tow. In prior art processes relating to crimped filament tow the tow is usually passed through the oven on a brattice. This ensures that no tension is applied to the tow which would otherwise destroy or reduce the crimp of the filaments in the tow. In the process of the invention, however, the tow is subjected to sufficient tension, while it is passed through the oven, that the unset crimp in the filaments forming the tow is substantially, if not entirely removed. Conveniently this is achieved by passing the tow through two sets of nip rollers one set located upstream of the oven and one set located downstream of the oven, the downstream nip rollers operating at a slightly higher speed, for example 25-30% faster than the upstream nip rollers. The crimp disappears on leaving the oven.

The tow produced in accordance with the invention may be subjected to any further conventional processing steps such as cutting the tow into staple fibres.

This aspect of the invention will now be described with reference to the following Example.

#### EXAMPLE

A conventionally made 3.3 dtex/67 Ktex crimped unset nylon 66 continuous filament tow having a cpcc of 8.5 and a crimp ratio of 25% was passed through a dip bath containing a water based siloxane emulsion having a solids content of 2.0%. After passing the tow through a nip roll at 80 psi the emulsion take-up in the tow, prior to being dried and cured, was found to be 27% by weight. The saturated tow was dried and cured in a rotary oven at a temperature of approximately 100 °C. A post oven positively driven nip roll operating at a line speed which was approximately 30% greater

than the pre-oven nip effectively straightened the tow filaments. The flat slickened tow was subsequently packaged using a conventional tow laying scanner and carton traverse unit.

#### Claims

1. A process for producing a tow of flat synthetic filaments comprising providing an unset low crimp filament tow, optionally transferring the tow to another site for further processing, and subjecting the tow to heat and tension which substantially removes all of the crimp from the filaments forming the tow.

2. A process for producing short length synthetic flat fibres comprising providing an unset low crimp filament tow, optionally transferring the tow to another site for further processing, subjecting the tow to a drawing operation which substantially removes the crimp from the filaments forming the tow and cutting the filaments in the tow into the desired short lengths.

3. A process as claimed in claim 2 in which the filaments forming the tow are provided with an unset crimp of the order of 2 crimps per crimped centimetre and a crimp ratio of approximately 10%.

4. A process as claimed in either claim 2 or claim 3 in which the crimp in the filaments is substantially removed by continuously passing the tow first through a set of rotating feed rolls and then through a set of rotating draw rolls in a steam chamber, the draw rolls rotating at a slightly higher speed than the feed rolls.

5. A process for producing a slickened filamentary tow comprising providing an unset low crimp filament tow, optionally transferring the tow to another site for further processing, applying an emulsion of a slickening agent to the tow, passing the coated tow through an oven at such a temperature and under such tension that (1) the coating is dried and the slickener cured and (2) the crimp is substantially removed from the filaments forming the tow.

6. A process as claimed in Claim 5 in which the filaments forming the tow are provided with an unset crimp of the order of 8.5 crimps per crimped centimetre and a crimped ratio of approximately 25%.

7. A process as claimed in either claim 5 or claim 6 in which the slickening agent used is a silicone based polymer.

8. A process as claimed in any one of claims 5 to 7 in which the coated tow is passed through an oven by means of two sets of rotating nip rollers, one set located upstream of the oven and one set

located downstream of the oven, the downstream nip rollers operating at a slightly higher speed than the upstream nip rollers.

9. A process as claimed in any one of claims 5 to 8 including the step of cutting the final tow into staple fibre. 5

10. A filamentary tow produced in accordance with any one of claims 1, 5, 6, 7 or 8.

11. Short length or staple fibre produced in accordance with any one of claims 2, 3, 4 or 9. 10

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