

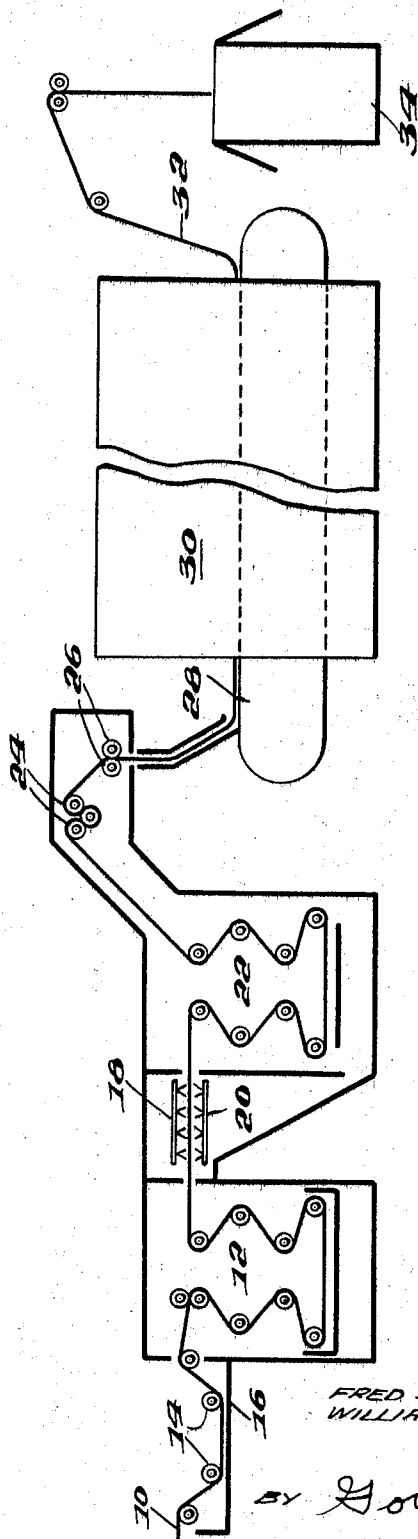
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PROCESS FOR REMOVING CRIMP FROM POLYESTER FILAMENTARY TOW

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3,423,501
PROCESS FOR REMOVING CRIMP FROM
POLYESTER FILAMENTARY TOW
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2 Claims

ABSTRACT OF THE DISCLOSURE

A process for decrimping crimped polyester tow by:
(1) Heating the tow to from about 65° to 80° C.,
(2) Drawing the tow to at least 150% of its uncrimped
length in an inert bath maintained at from 76° to 100°
C., and
(3) Drying the tow to less than about 1% moisture.

SPECIFICATION

This invention relates to the processing of continuous,
synthetic filamentary tow and more particularly to a
process for removing crimp from synthetic filamentary
tow which has been mechanically crimped.

It is well known in the textile industry to crimp tow
comprising many thousands of filaments to facilitate in-
process handling of the filaments as a contiguous entity
and to provide for interfilamentary cohesion in textile
processing after the tow has been cut to staple or broken
to sliver. The mechanically induced crimp of some syn-
thetic fibers is easily removed; often the crimp fails even
to survive the complete textile process in which it is de-
signed to contribute fiber-to-fiber cohesiveness. In the
condensation polymers such as nylons and polyesters,
the tendency to heat-set in any artificially-induced con-
figuration contributes to good crimp durability in normal
processing.

However, some fiber uses, notably the fabrication of
pile fabrics, require a fiber having no crimp at all. One
obvious method to obtain such a product is simply to
bypass the initial crimping step, leaving the tow in its
as-produced straight configuration. For economical in-
ventory, however, it has been found desirable to stock
only the crimped product and to use the material as sup-
ply for the fiber uses requiring no-crimp tow. This en-
ables the maintenance of an inventory of only the major
item (product with crimp) with the resultant savings
realized from storage space and associated cost.

Accordingly, it is an object of this invention to provide
a novel process for decrimping crimped tow. A further
object is to provide a novel process for decrimping
crimped tow composed of condensation polymer fila-
ments. Other objects will become apparent from the de-
scription hereinafter.

The objects of this invention are accomplished, in
general, by a process which comprises preheating a con-
densation polymer tow to a temperature in the range
of 65° C. to 80° C., drawing the tow to at least 150%
of its uncrimped length in a bath maintained at 76° C.
to 100° C. and thereafter drying the tow to a moisture
content of less than 1% by weight. Preferably, the tow
is drawn from about 200% to about 250% of its un-
crimped length.

The accompanying schematic drawing further illus-
trates the novel process of this invention and apparatus
which can be utilized to accomplish the novel process.
In the single figure a crimped condensation polymer tow
10, from a source not shown, is advanced by feed rolls
12 or bars under rolls 14 in preheating bath 16, which

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is maintained at a temperature in the range of 65° C. to
80° C. The tow then passes into spray-drawing enclosure
18, in which are positioned a plurality of sprays 20 which
constantly bathe condensation polymer tow 10 with an
aqueous medium, heated to and maintained at from about
96° C. to about 100° C. Draw rolls 22 are driven at a
surface speed sufficiently greater than that of feed rolls
12 to provide the required degree of draw in spray-
drawing enclosure 18. By means of rolls 24 and 26, con-
densation polymer tow 10 is deposited on endless belt 28
and passes through continuous circulating-air dryer-re-
laxer 30, which is adjusted to operate at a suitable drying
temperature such that the moisture content of condensa-
tion polymer tow 10 is reduced to less than 1% and the
dry-heat shrinkage is also reduced to the desired level.
The decrimped tow 32 can then be packed in carton 34
and stored until needed. Alternatively, the decrimped tow
32 could be wound on a ball warper (not shown).

The following example is illustrative of the invention
but not in limitation thereof. All parts and percentages
are by weight unless otherwise indicated.

Example

Three-denier-per filament polyester tow of 450,000
total denier comprising a copolymer of 98% ethylene
terephthalate and 2% ethylene sulfoisophthalate (the co-
polymer being made in accordance with the process of
U.S. Patent No. 3,018,272) is prepared by a process sub-
stantially as described in U.S. Patent No. 2,918,346. The
polyester tow is then crimped in a conventional stuffing
box crimper similar to that described in U.S. Patent No.
2,734,794 and packed in shipping cartons for storage.

Two cartons of tow such as described above are de-
crimped by the following procedure: Using the apparat-
us shown in the accompanying drawing, a carton of tow
is positioned at the feed end (left side) and threaded
through feed rolls 12, into preheating bath 16, spray-
drawing enclosure 18 and draw rolls 22. The tow is laid
on the belt of a continuous belt (28) dryer-relaxer 30
in which it is dried by air at the temperature indicated in
the table below.

Conditions used and properties of the crimped tow and
of the decrimped tow are also given in the table. By
"crimp take-up" is meant the percent loss in length due
to crimp when a length of tow loaded with 0.121 gram
per denier is unloaded and allowed to retract. By "dry
heat shrinkage" is meant the percent loss in length which
occurs on heating the tow in dry air at 193° C. for 30
minutes.

TABLE

Properties	Carton No. 1		Carton No. 2	
	Supply	Decrimped	Supply	Decrimped
Denier per filament.....	3.01	2.96	3.00	2.95
Tenacity (g.p.d.).....	2.7	2.5	2.8	2.7
Elongation (percent)...	33.0	29.0	31.1	28.4
Dry heat shrinkage (percent).....	4.5	7.1	4.7	7.7
Crimp take-up.....	19.6	2.8	17.1	2.4
Process conditions:				
Draw ratio.....		2.14		2.30
Speed (y.p.m.):				
Output.....	83.3		83.3	
Input.....		39		36.4
Preheating bath temperature (° C.).....		70		75
Feed roll section temperature (° C.).....		75		75
Spray-drawing en- closure tempera- ture (° C.).....		98		98
Draw roll section temperature (° C.).....		80		80
Circulating-air dryer-relaxer temperature (° C.).....		150		155

The crimp take-up measurements are an indication of the decrimping accomplished and the figures for the example hereinbefore clearly illustrate that the tow was in fact decrimped.

The present invention has made possible the decrimping of a crimped condensation polymer tow which is the equivalent of tow which has never been crimped in end uses requiring a tow with zero crimp. In fact, it is surprising that tow with essentially no crimp can successfully be laid on the continuous belt in the circulating-air dryer-relaxer or packed in cartons without the tow having lost its contiguity. In some manner not clearly understood, crimping and decrimping appear to make the tow more pliant and cohesive.

Although the example illustrates mechanically crimped tow as the starting material, it should be obvious that tow having other types of crimp can also be decrimped. For example, the spontaneous crimp illustrated in U.S. Patent No. 3,050,821 and the random curvilinear crimp shown in U.S. Patent No. 3,055,080 can also be used as starting materials. Additionally, it should be apparent that the tow could compose filaments made of any desired condensation polymers, such as the nylons and the polyesters. The tow can have a total denier as is desired, tows having a total denier of from about 400,000 to about 500,000 have been found to be convenient.

It will be apparent that many widely different embodiments of this invention may be made without departing

from the spirit and scope thereof, and therefore it is not intended to be limited except as indicated in the appended claims.

What is claimed is:

1. The process of decrimping polyester filaments which comprises preheating a tow of crimped filaments to a temperature in the range of from about 65° C. to about 80° C., drawing said tow to at least 150% of its uncrimped length while passing it through an inert aqueous bath maintained at a temperature of from about 96° C. to about 100° C., and drying said tow to less than about 1% moisture, by weight, whereby the resulting tow is free from crimp.

2. The process of claim 1 wherein said tow is drawn to from 200% to 250% of its uncrimped length.

References Cited

UNITED STATES PATENTS

3,129,485	4/1964	Shattuck	28—72
3,176,374	4/1965	Kinnear	264—290
3,259,681	6/1966	Bull et al.	264—290

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