United States Patent

Strohmaier

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[54] FALSE TWISTED RIBBONS

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[52] **U.S. Cl.**.....**57/140,** 57/155, 57/157, 57/167

[51] **Int. Cl.**.....**D02g 3/06**

[58] **Field of Search**.....57/31, 77.3, 151, 140, 167, 57/155, 157, 139, 156, 154, 165

[56] **References Cited**

UNITED STATES PATENTS

3,053,038	9/1962	Weiss et al.	57/77.3 X
3,112,600	12/1963	Stoddard et al.	57/77.3 X
3,126,699	3/1964	Lefevre et al.	57/167 X
3,500,626	3/1970	Sandiford	57/167 X
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FOREIGN PATENTS OR APPLICATIONS

960,067	6/1964	Great Britain	57/167

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[57] **ABSTRACT**

False twisting ribbons of from 100 to 2,000 denier using a mechanical false twisting spindle rotating at from 10,000 to 500,000 r.p.m. to produce a false twisted ribbon in which the ribbon is longitudinally folded on itself from both sides but contains substantially no twist but rather has embossed striations which give the appearance of a twist.

5 Claims, 5 Drawing Figures

FIG. 1

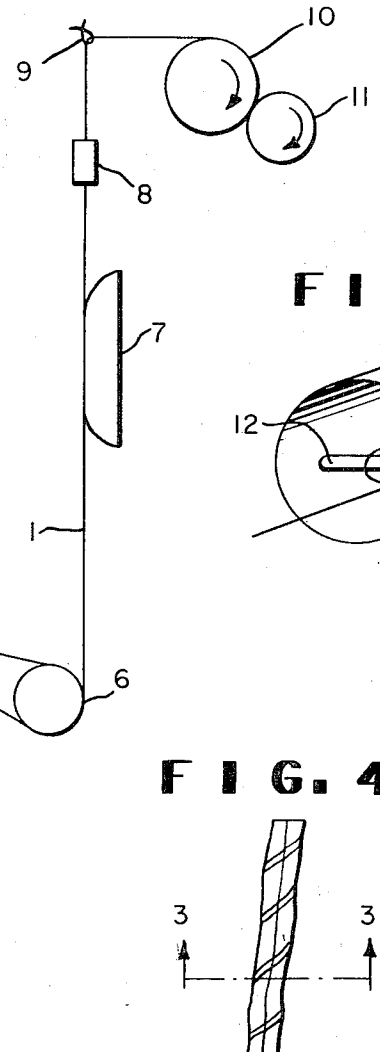


FIG. 3



FIG. 2

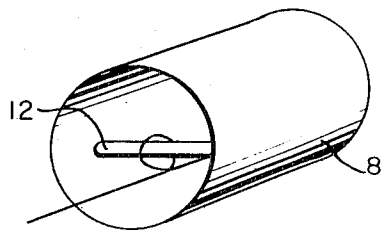
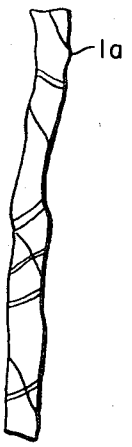


FIG. 4

FIG. 5



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FALSE TWISTED RIBBONS

BACKGROUND OF THE INVENTION

The present invention relates to certain false twisted ribbons and to the process of producing such ribbons.

In the past, false twisted yarns have been produced according to the techniques set forth in U.S. Pat. No. 3,279,164 issued Oct. 18, 1966 to A. L. Breen et al.

SUMMARY OF THE INVENTION

The present invention involves running a ribbon through a mechanical false twisting apparatus run at a relatively low speed and the resultant product which is a folded ribbon having substantially straight sides with twist appearing striations on the surface of the ribbon.

Preferred ribbons are from 100 to 2,000 denier and have a width of from 10 to 200 mils.

The process of this invention is useful for treating ribbons of any natural or synthetic filamentary material with the synthetic thermoplastic resins such as polyamides, polyesters and polymers of acrylonitrile being preferred. Suitable polymers can be found among the fiber forming polyamides and polyesters which are described in U.S. Pat. Nos. 2,071,250; 2,071,253; 2,130,523; 2,130,948; 2,190,770 and 2,465,319. The preferred group of polyamides comprises such polymers as poly(hexamethylene adipamide), poly(hexamethylene sebacamide), poly(epsilon caprolactam), and the copolymers thereof. Among the suitable polyesters are poly(ethylene terephthalate) and the corresponding copolymers containing sebacic acid, adipic acid, or isophthalic acid as well as the polyesters containing recurring units derived from glycols with more than two carbon atoms such as diethylene glycol, butylene glycol and decamethylene glycol. Copolymers of hexamethylene diamine and epsilon caprolactam containing from 75 to 95 percent hexamethylene diamine and from 25 to 5 percent epsilon caprolactam are especially preferred.

The false twisting of the present invention is carried out by feeding the ribbon from whatever it is stored on, such as a spool or bobbin, heating the ribbon to from 15 to 85° C. below the crystalline melting point, running the ribbon through a mechanical false twisting spindle operated at from 5,000 to 500,000 r.p.m. and taking up the thus false twisted ribbon on a suitable takeup means such as a bobbin. The takeup means should be driven at speed within from −10 percent to +10 percent of the speed of the ribbon feeding means. The ribbon may be heated to the desired temperature passing it over a heated metal plate or roll, passing it through a heated bath of liquid such as water or oil or blowing a hot gas such as air on the ribbon or by radiation. Due to the speed with which the ribbon is passed over the plate, the plate is maintained at a temperature considerably higher than the temperature to which it is desired to heat the ribbon. For instance, for 500 to 900 denier ribbons of copolymers of hexamethyleneadipamide/caprolactam which has a crystalline melting point of 265° C., the metal plate should be maintained at from 205° to 235° C. and should be large enough to provide a 0.2 to 1.0 second residence time of the ribbon in contact with the metal plate.

DESCRIPTION OF THE DRAWING

In the drawing,

FIG. 1 is a schematic drawing of the essential elements of the false twisting apparatus.

FIG. 2 is a perspective view of the false twisting spindle used in the apparatus of FIG. 1.

FIG. 3 is a cross section taken on line 3—3 of FIG. 4.

FIG. 4 is a plan view of a false twisted ribbon.

FIG. 5 is a plan view of another false twisted ribbon.

As shown in FIG. 1, the ribbon 1 is fed from supply package 2 to disk tensioners 3 and 4 to feed rods 5 and 6 across heated metal plate 7 through twisting spindle 8 through traverse 9 and is taken up by takeup package 10 driven by drive roll 11. Conventional varying speed drives as are known in the art to keep the surface speeds of the feed rolls and takeup package constant, are normally used in the performance of this invention. Due to their complex nature, and since the details of such drives are not part of this invention, such a drive is not shown here. Spindle 8 is driven by pulley. Generally, spindle 8 is driven at a speed of from 10,000 to 500,000 r.p.m., and preferably from 34,000 to 142,000 r.p.m., and the ribbon is fed at from 30 to 300 yards per minute to provide 15 to 50 turns per inch of twist. The false twisting spindle 8 is shown in greater detail in FIG. 2, wherein the ribbon is wrapped once around cross-pin 12 as it is passed through spindle 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A "Superloft" No. 550 machine in Example 1–10 and a "Superloft" No. 552 machine in Example 11 is set up as shown in FIG. 1. The operating conditions used and properties of the resultant product are reported in Table I. In each of Examples 1–10 the ribbons were formed of a copolymer of 90 mole percent hexamethylene diamine and adipic acid and 10 mole percent caprolactam commonly referred to as a 90/10 66/6 copolyamide, which ribbons were 1 mil thick and of the width required to correspond to the denier indicated in Table I. In Example 11, the ribbon was 150 gauge by 1/64 inch wide "Lurex" MM blue which is a ribbon 1.5 mils in thickness made from metallized polyethylene terephthalate. In each case the false twisted product was a somewhat flattened hollow tube with embossed striations to give the appearance of a twist as shown in FIG. 4. When higher numbers of nominal twists per inch were used, it was necessary to apply tension to avoid obtaining a product which is a hollow tube with definite alternating "S" and "Z" twists.

TABLE I

Example	Denier (supply), gms.	Nominal twist/ inch	Windup speed, y.p.m.	Overfeed, percent	Spindle speed, r.p.m.	Plate temp., ° C.	Denier (twisted), gms.	Break strength, gms.	Tenacity, gms./ denier	Break elongation, percent
1	530	16	61	+3.5	34,200	221				
2	530	16	61	+6.2	34,200	221				
3	530	16	61	+0.7	34,200	221	493	1,744	3.53	39.5
4	530	16	61	−3.5	34,200	221	503	1,514	3.01	29.9
5	530	19	52	+0.7	34,200	221	528	1,540	2.93	41.4
6	875	16	61	+3.2	34,200	221	876	2,175	2.48	35.8
7	875	16	61	+6.5	34,200	221	886	2,332	2.63	47.5
8	875	16	61	+0.7	34,200	221	894	2,203	2.46	36.6
9	875	16	61	−3.5	34,200	221	867	2,369	2.70	35.8
10	875	19	52	+0.7	34,200	221	891	2,114	2.37	32.0
11		49	81	−9.3	142,000	182				

I claim:

1. A process of false twisting a ribbon of a synthetic thermoplastic crystalline resin which comprises the steps of (a) heating the ribbon, which is from 100 to 2,000 denier and from 10 to 200 mils wide, to a temperature from 15° to 85° C. below its crystalline melting point, (b) feeding the heated ribbon at from 30 to 300 yards per minute around a pin mounted in a rotating false twisting spindle operated at from 10,000 to 500,000 revolutions per minute and (c) taking up the resulting false twisted ribbon on a takeup means whereby to produce a ribbon which is folded upon itself without any substantial twisting.

2. The process of claim 1 wherein there is an overfeed from −10 to +10 percent as based on the linear takeup rate.

3. The process of claim 2 wherein the ribbon is formed from a polyamide.

4. The process of claim 3 wherein the polyamide is a copolymer of hexamethylene adipamide and caprolactam containing from 75 to 95 percent hexamethylene adipamide and from 25 to 5 percent caprolactam.

5. A 100 to 2,000 denier false twisted ribbon formed of a synthetic thermoplastic resin in which the ribbon is in the form of a flattened hollow tube having substantially straight sides wherein the joint between the edges of the original ribbon is substantially parallel with the sides of the ribbon which ribbon has embossed striations on the surface thereof giving the appearance of a false twist.