United States Patent

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[33] **Germany**
[31] **P 17 85 140.0**

[54] YARN BULKING APPARATUS

5 Claims, 6 Drawing Figs.

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[51] Int. Cl. **D02g 1/02,** D02g 1/16
[50] Field of Search ..... 57/34, 34 B, 77.3, 157 F; 28/1.3, 1.4, 72.11, 72.12

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ABSTRACT: Apparatus for manufacturing bulky yarns employing flowing gaseous or liquid media by the false twist technique. It consists of a tubular yarn guide chamber and a lateral conduit for the fluid medium disposed perpendicularly to the axis of the guide chamber and opening into same tangentially to the internal wall thereof, the guide chamber being cylindrical and at the yarn inlet end having a drastically reduced cross-sectional area compared to the cross section of the remainder of the chamber. The fluid inlet is located immediately downstream of the yarn inlet end (in the direction of movement of the yarn) in the enlarged portion of the chamber. The latter narrows at a point downstream of the fluid inlet (in the direction of movement of the yarn) and subsequently opens into a tubular duct the internal wall of which contains groovelike recesses over at least part of its length.

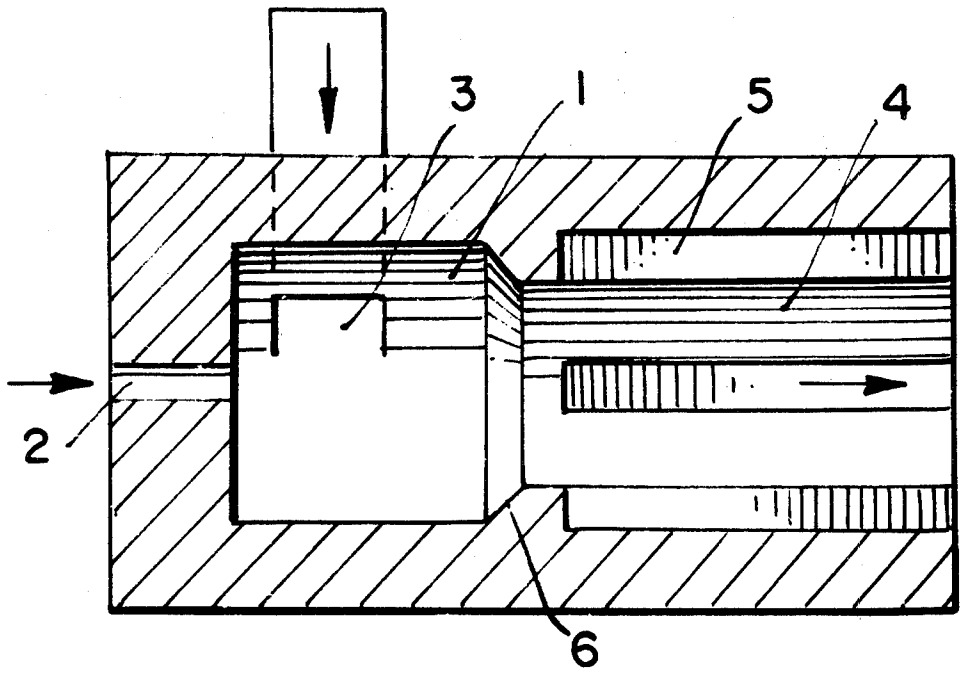


FIG. 2

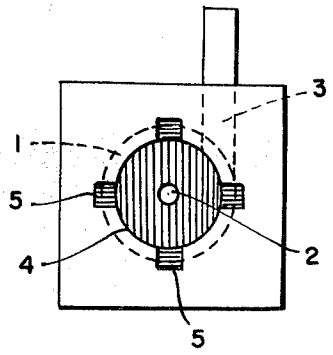


FIG. 1

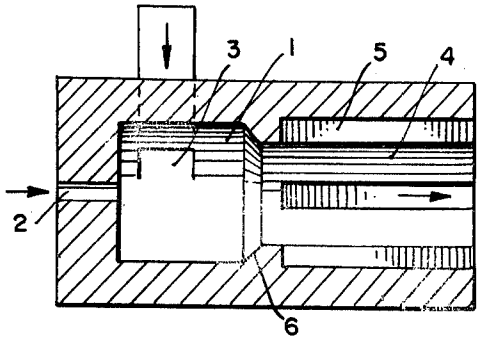


FIG. 3

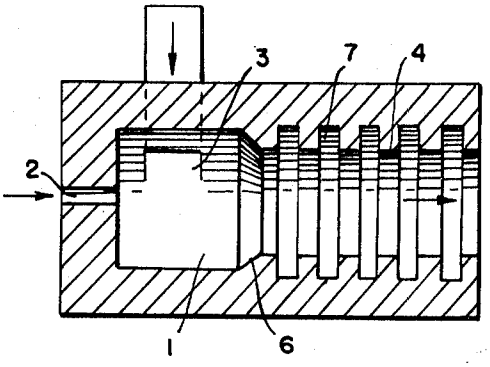


FIG. 5

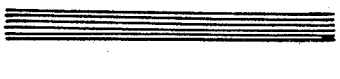
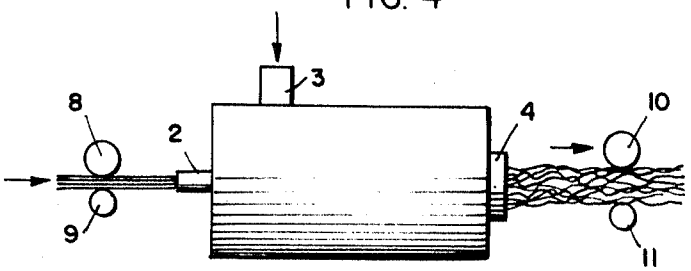


FIG. 6



FIG. 4



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YARN BULKING APPARATUS

The present invention relates to apparatus for the manufacture of bulky yarns, i.e. yarns made up of random-convoluted individual filaments, using a fluid medium by the false twist technique, said apparatus consisting of a tubular yarn guide chamber and an inlet for the fluid medium said inlet being disposed perpendicularly to the axis of the guide chamber and opening into the same tangentially to the internal wall thereof, the guide chamber being cylindrical and having a drastically reduced cross-sectional area at the yarn inlet end compared with the cross section of the remainder of the chamber, and the fluid inlet being located immediately downstream of the yarn inlet end (in the direction of movement of the yarn) in the enlarged portion of the chamber.

Apparatus of this kind are already known in which the yarn guide chamber is a smooth-walled tube of uniform cross section. The yarn to be treated is supplied to the yarn inlet by means of feed rolls, picked up by the tangentially entering fluid in the enlarged section following the yarn inlet and given a rotational movement, and subsequently withdrawn from the guide chamber by means of takeup rolls. In this treatment, the yarn is twisted, heat-set by the fluid and subsequently backtwisted.

The disadvantage of this apparatus, however, is that the yarn produced by it is not sufficiently bulked and the desired wool character is not quite satisfactory.

It is an object of the present invention to provide an apparatus for making bulked yarn which, compared with yarn treated with conventional equipment, has an improved bulkiness.

This object is achieved in accordance with the invention in an apparatus comprising a tubular yarn guide chamber and a lateral conduit for the fluid medium disposed perpendicularly to the axis of the guide chamber and opening into the same tangentially to the internal wall thereof, the guide chamber being cylindrical and having a drastically reduced cross-sectional area at the yarn inlet end compared with the cross section of the remainder of the chamber, the fluid inlet being located immediately downstream of the yarn inlet end (in the direction of movement of the yarn) in the enlarged portion of the chamber, wherein said yarn guide chamber narrows downstream of the fluid inlet (in the direction of yarn movement), and subsequently opens into a tubular duct the internal wall of which contains groovelike recesses over at least part of its length. The groovelike recesses may run parallel or perpendicular to the axis of the tubular duct or run on helical paths around the duct axis. The constriction of the chamber will preferably have a conical shape.

Two embodiments of apparatus in accordance with the invention are illustrated diagrammatically in the accompanying drawings and will be described in greater detail hereinafter:

FIG. 1 is a longitudinal section through one of the embodiments of apparatus in accordance with the invention;

FIG. 2 illustrates the front elevation of the apparatus shown in FIG. 1;

FIG. 3 is a longitudinal section through another embodiment of apparatus in accordance with the invention;

FIG. 4 illustrates the overall arrangement of the apparatus in side elevation;

FIG. 5 is an untreated bundle of filaments supplied to an apparatus in accordance with the invention and viewed in side elevation (magnification about 10 times); and

FIG. 6 is a bundle of bulked filaments seen after leaving the bulking device (magnification about 10 times).

The apparatus in accordance with the invention, used to produce bulked yarns, consists in accordance with FIGS. 1 to 3 of a yarn guide chamber 1 with a lateral conduit 3 for the fluid medium which opens tangentially to the internal wall, an inlet opening 2 for the yarn to be treated, said opening being coaxial to chamber 1, and a tubular duct 4 which, in the direction of movement of the yarn, adjoins the conically narrowed portion 6 of chamber 1. The tubular duct 4 is provided on its internal wall with groovelike recesses 5, 7 which may for example be located parallel to the duct axis (FIG. 1) or perpendicular thereto (FIG. 2).

The yarn to be treated which is in the form of a bundle of filaments, is supplied in the manner shown in FIGS. 1 to 4 by feed rolls 8 and 9 through inlet opening 2 into chamber 1. In chamber 1, the yarn is picked up by the tangentially injected fluid 3, given a rotational movement and carried onward in the direction of duct 4. The cross section of inlet 2 is so small in relation to the cross section of chamber 1 and duct 4, that only a very small quantity of the fluid injected through conduit 3 can escape through inlet 2 and the main direction of flow of said fluid is toward duct 4. Through the superimposition of the rotational and axial movements of the yarn within the yarn guide chamber the yarn is twisted and backtwisted. On its passage through duct 4 connected to chamber 1, the yarn, because of the secondary eddies produced in the fluid medium in the groovelike recesses 5, 7, and at the edges thereof, is additionally convoluted and made bulky. This bulking process is assisted by the turbulence produced by the fluid in duct 4 causing the fiber bundle to oscillate. The treated yarn is supplied to a wind-up device via takeup rolls 11 and 12 or direct to a further processing stage.

The fluid medium can be a gas or a liquid which is supplied to the treatment chamber by a blower or a pump as the case may be. Air or steam is preferred. In order to produce a permanently bulked yarn, the latter, if consisting of threads of a thermoplastic synthetic material, should be plastically deformable during treatment. This can, for example, be achieved by using a gas as the fluid medium which has been heated prior to entry into the treatment chamber to a temperature at which the threads are plastically deformed, or the treatment chamber itself is directly heated or alternatively a fluid medium is used which softens the threads by chemical action. It is equally conceivable that an apparatus in accordance with the invention for producing bulked yarns could directly follow a spinneret so that the yarn could be fed into the treatment chamber while still in a plastic condition.

The advantage of a device in accordance with the invention, as compared with known bulking apparatus, resides essentially in the fact that yarn treated in a device according to the invention shows superior bulk and contains no loops, coils or whorls which, during further processing, could snag in the yarn-guide devices and thus create problems. An apparatus in accordance with the invention is furthermore very simple in design and its dimensions, in particular the diameters of the individual chambers and inlets and outlets, as well as the length and depth of the groovelike recesses, can be adapted to any operating conditions and to the desired degree of bulking.

EXAMPLE

In order to bulk an 18 denier 67-filament thermoplastic polyamide yarn (see FIG. 5) an apparatus was used of the kind shown in FIGS. 1 and 2. The fluid medium used was air and this was heated to about 140° C. prior to entry into the apparatus. The initial yarn illustrated in FIG. 5 was supplied to the device at the rate of about 250 *m/min.* The bulked yarn coming from the device has the appearance shown in FIG. 6, and contained no coils or loops.

The temperature to which the yarn must be heated during the treatment depends upon the material and can vary within wide limits. It has been found that good results are achieved if the yarn used in this example is heated prior to or during the treatment to a temperature of between around 80° and 170° C. With crystalline thermoplastic material it must of course be borne in mind that the crystallite melting temperature should not be exceeded. The temperature of the air used for fluid medium is dependent upon the time of dwell of the yarn in the air environment, and can exceed the indicated temperature maxima.

We claim:

1. Apparatus for the manufacture of bulky yarns using a fluid medium by the false twist technique, said apparatus com-

prising of a tubular yarn guide chamber and an inlet for the fluid medium, said inlet being disposed perpendicularly to the axis of the guide chamber and opening into same tangentially to the internal wall thereof, the guide chamber being cylindrical and having a yarn inlet end of drastically reduced cross section compared with the cross section of the remainder of the chamber, and the fluid inlet being located immediately downstream of the yarn inlet end (in the direction of movement of the yarn) in the chamber, wherein the yarn guide chamber, at a constriction narrows downstream of the fluid inlet (in the direction of yarn movement), and thereby opens into a tubular duct, of reduced cross section the internal wall

of which contains groovelike recesses over at least part of its length.

2. Apparatus as claimed in claim 1, in which the groovelike recesses are disposed parallel to the axis of the tubular duct.

3. Apparatus as claimed in claim 1, in which the groovelike recesses are disposed perpendicularly to the axis of the tubular duct.

4. Apparatus as claimed in claim 1, in which the groovelike recesses extend helically around the duct axis.

5. Apparatus as claimed in any preceding claim, in which the constriction of the yarn guide chamber is conical.