United States Patent

[11] **3,603,068**

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[73] Assignee **Teijin Limited Osaka, Japan**
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[33] **Japan**
[31] **43/19915 and 43/34637**

[54] **APPARATUS FOR FALSE TWISTING**
4 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** ..... **57/104,** 57/34 HS, 57/77.45
[51] **Int. Cl.** **D01h 1/24**
[50] **Field of Search** ..... 57/34, 77.45, 34 HS, 104, 105

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ABSTRACT: The present invention is intended to false twist a number of continuous filaments or yarns in the sheet form with a compact and inexpensive system comprising much fewer heating and cooling members than conventional false twisters and belt-driven spinners, said sheet form being utilized for treating filaments or yarns by waxing, sizing, etc. and said belt being controlled in driving by pneumatic mechanism so as to enable each spinner to be urged against the belt and to rotate for inserting twist consistent from spinner to spinner to passing continuous filaments or yarns.

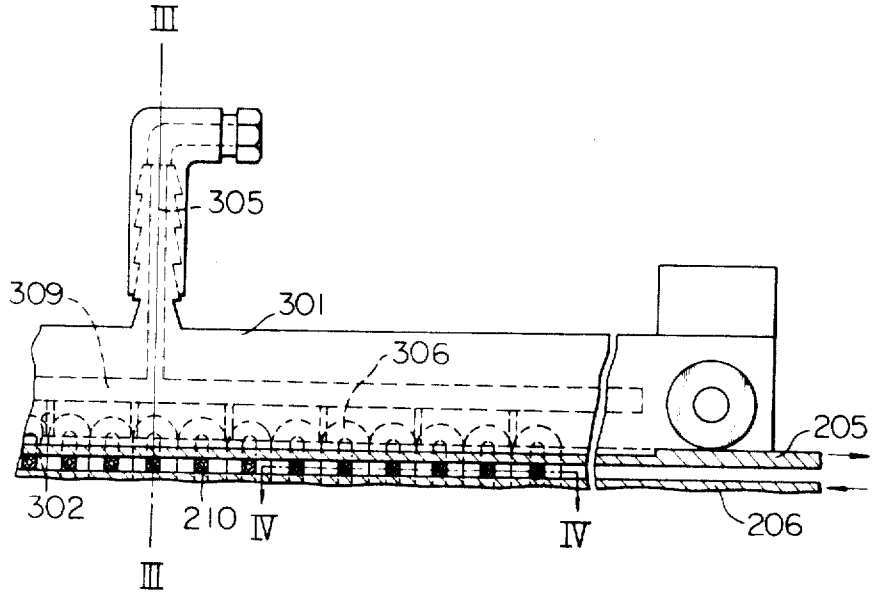

Fig. 1

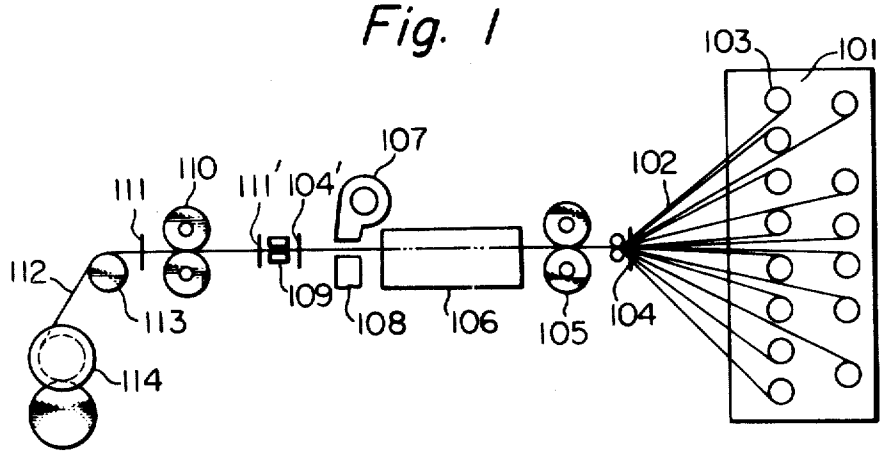

Fig. 2

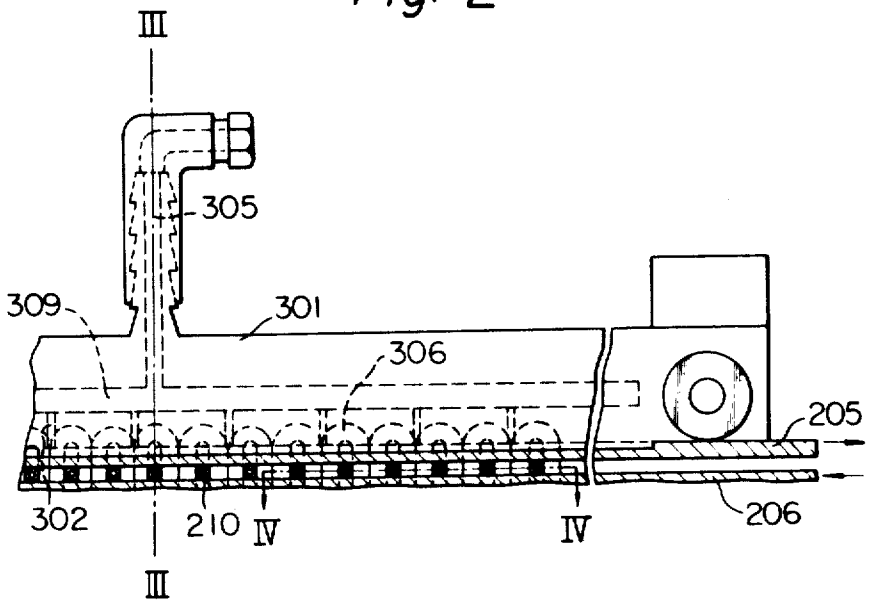

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Fig. 3

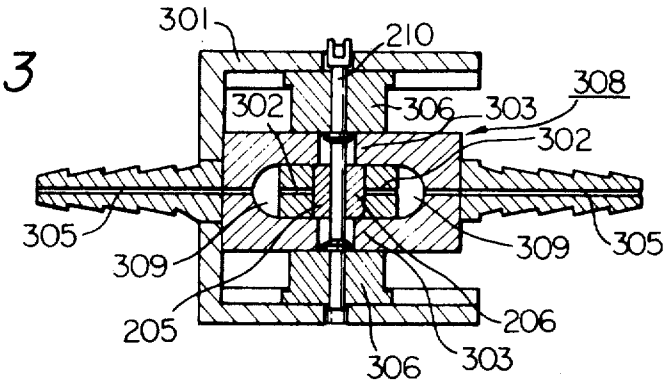


Fig. 4

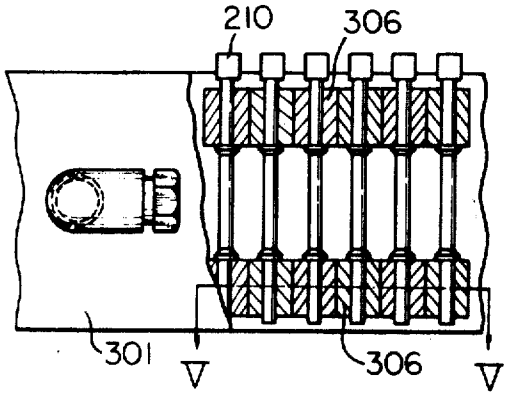


Fig. 6

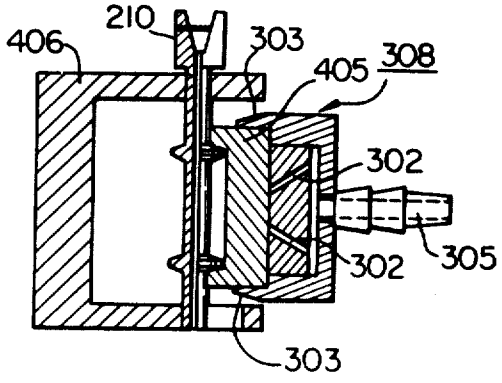
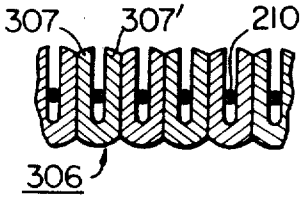


Fig. 5



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APPARATUS FOR FALSE TWISTING

The present invention relates to a process and an apparatus for false twisting a number of continuous filament yarns.

When a filament yarn is given a spin revolving around the yarn axis at a given rolling or twist center on the yarn, one portion is subjected to an S (or Z) twist and the other a Z (or S) twist, the borderline being set up at said rolling center. While thus given a spin, the filament yarn is made to pass through said given rolling center. Thus the portion moving toward the rolling center is twisted in a given direction and the portion moving away from it is untwisted. This phenomenon is called false twisting. It is known to false twist a filament yarn by leading it through a spinner, which is rotated with a belt system (for instance, Japanese Pat. Publication No. 1183/62). This false twist technology is applied to crimped product manufacture, and comprises heat setting a twist in the twist zone (that is, at the portion of the filament yarn moving toward the spinner).

When a number of filament yarns are false twisted, the gap between filament yarns has been hitherto set to approximately 30 cm. or above. It has been found that it is possible to carry consistent false twisting into effect for a number of filament yarns with a gap of about 2 cm. or below of one yarn with the other, if compressed air is blown against the front or back of belts in the belt assembly for driving said spinners. As a result of this invention, many advantages have been obtained : the apparatus has been made compact, one unit of heater and cooler is capable of twist-setting, and furthermore the processed product can be wound directly to the beam. In addition, the product is capable of being processed before the winding-up to the beam as desired in various ways such as heat-treatment, sizing, lubrication, waxing, etc. in the advantageously collected sheet form.

This invention offers a process for false twisting a number of filament yarns by causing each yarn to pass through a spinner while revolving the spinner by means of a belt assembly, characterized by the steps of maintaining a number of filament yarns in the sheet form, of running the yarn through the spinner in the sheet Form, and of belt driving said spinners while blowing compressed air against the back of the running belts.

In carrying the present invention into effect, it is advisable and advantageous to cause each yarn to pass through each spinner while maintaining a number of filament yarns in the sheet form and substantially keeping the gap between each yarn and other yarn at about 2 cm. or below.

Further, this invention offers the improvement in an apparatus for false twisting filament yarns comprising a number of spinners arranged at a short distance for false twisting said filament yarns and a belt assembly for rotating said spinners. The improvement developed by us comprises and air jet extending to one face of the belt opposite to the other face where the belt makes contact with the spinners, a plenum being provided in the air jet, an air inlet for feeding compressed air to the plenum, and channels connecting the plenum to the face of the air jet, said air jet holding the belt slidably in such a manner that the air fed from the face of the air jet will exert a quasi-static pneumatic pressure on the back of the belt over the belt zone.

In this invention spinners are rotated preferably with a pair of belts running in the directions opposite to each other and contracting the spinners at the same time. In this case, said air jet and air inlet should be disposed per belt. In order to control the variations in the position of a spinner along the running direction of the belt, which are attributable to variations in the belt tension and/or belt speed, it is preferable to dispose a pair of members or more than a pair at 90° against the running direction of the belt and the axial direction of the spinner.

Another embodiment of this invention is that each spinner being held rotatably, all the spinners may be driven with one belt.

One embodiment of this invention will be now described with reference to the accompanying drawings in which :

FIG. 1 is a flowsheet for explaining a curl process to which the present flase twist process is applicable.

FIG. 2 to 5 are to explain one embodiment of the present false twisting, FIG. 2 being a front elevation,

FIG. 3 a cross-sectional view of FIG. 2 along the line III—III,

FIG. 4 a cross sectional view of FIG. 2 along the line IV—IV,

FIG. 5 a cross sectional view of FIG. 4 along the line V—V and

FIG. 6 which is another embodiment of the present false twist apparatus and is a view of a cross section cut off with a plane perpendicular to the belt running direction.

With reference to FIG. 1, a number of filament yarns **102** are pulled from bobbins **103** on a creel-stand **101** with feed roller **105** and led into heater **106**, during which time said filament yarns are arranged in the sheet form having a distance of about 2 cm. or below between each yarn and other after they are passed through reed **104**. The heated filament yarns are cooled between blower **107** discharging cool air and air inlet **108** and false twisted with false twist device **109**. Twist introduced to said filament yarns is set by heating with heater **106** and by cooling with blower **107**. Processed filament yarns **112** are wound up on take up beam **114** after passing through deliver rollers **110**, reed **111**, and traverse roller **113**. The required overfeed of the yarns is secured by the control of peripheral speed ratio between feed rollers and delivery rollers. It is advantageous to dispose reeds **104'** and **111'** to prevent filament yarns **102** from balooning before and after false twist device **109**. The false twist equipment of the present invention is further described as under with reference to FIG. **2** to **6**. FIG. **2** to **5** show one embodiment of the present invention. Spinners **210** are driven with a pair of belts **205** and **206** running opposite to each other. As seen in FIGS. **3** and **4**, each spinner **210** is rotatably held with a pair of holding metallic fittings **306** slidably attached to frame **301**. It is advisable to have the distance between the two adjoining spinners at 2 cm. or below and to dispose the spinners at an equal distance on one plane. The spinners are rotated around their axes, driven by belts **205** and **206** running to the direction shown by an arrow in FIG. **2**. Holdings fittings **306** resist the thrust caused by the advance of filament yarns. The holding fittings, as seen in FIG. **5**, have a pair of arms **307** and **307'** extending to a direction making 90° with the belt running direction and the axial direction of the spinner and hold the spinners rotatably between the arms. These arms act as bearings of the spinners for controlling variations in the position of the spinner to the belt running direction. The thrust of the spinners caused by the running of filament yarns can be made resisted with the belt itself by the registration of the belt and the spinner, for instance, as shown in FIG. **6**. In this case, it is preferable to install at least a pair of members (equivalent to said arms) extending to a direction making 90° with the belt running direction and the spinner axial direction so that the members slidably hold each spinner between themselves.

The air jet blowing compressed air to the back of the belt in the belt zone which makes contact with the spinners is clearly understood in FIGS. **2** and **3** provided that in FIG. **2** one side alone of the air jet and belt along the queue of spinners is shown. Compressed air is introduced from air inlet means **305** into plenum **309** in air jet device **308**, which extends to one face of the belt opposite to other face where the belt makes contact with the spinner. Then the air is passed through channels **302** and fed to the face of the air jet device. As seen in FIG. **3**, the air jet device has protuberances **303** at both edges of the face, which protuberances secure belts **205**, and **206** slidably therein. The distance between the face of the jet device and the back of the belt is preferably from about 0.05 to about 0.5 mm. Between the side of the belt and said protuberances of the air jet device is so-called air cushion formed and at the back of the belt does a quasi-static pneumatic pres-

sure work. The optimum gap of spinners **210** (the distance between one spinner and its adjoining spinner) is approx. 5 to 20 mm. in ordinary circumstances, depending upon the hardness and thickness of a belt to be used and the size of a spinner to be employed. It is a disadvantageous to have a gap too broad because the desired compactness of an apparatus is lost and air leakage becomes great on account of the belt forming into the shape of an arch .

The process as shown in FIG. **1** was carried into effect with a false twist device as shown in FIGS. **2** to **5** under the following conditions, resulting in the production of consistent quality bulked yarn: The number of spindles **200**, processing speed 40 m/min., spinner rotating speed **100,000** r.p.m., temperature of heater 240° C. overfeed 2 percent, amount of compressed air 8 liter/min. per spindle, type of yarn 150 denier-30 filament polyethylene terephthalate continuous filament yarn, spinner pitch 8 mm., channel diameter 0.5 mm., channel pitch 16 mm. air pressure 3 kg./cm.^{2} gage, belt material hard polyurethane, belt hardness **80** to **82**, and the distance between the face of the air jet device and the back of the belt 0.075 mm. The maximum slippage of the spinners, i.e., the difference between the maximum r.p.m. and the minimum r.p.m. was 5 percent. Undesirable heating and abrasion of the belt could not be found. This seems to be attributed to the cooling effect by air injection and the air cushion effect.

FIG. **6** shows another embodiment of this invention. Here is each of a number of spinners **210** arranged at equal distances held rotatably with supporting member **406** and all the spinners urged against one running belt **405** are rotated. The jet device, one of the critical features of this invention in FIG. **6** is the same as in FIGS. **2** to **4**.

What is claimed is:

1. Apparatus for false twisting filament yarns comprising

a plurality of spinners adapted to receive and false twist the filament yarns;

support means for rotatably mounting said spinners in planar, parallel relation;

belt drive means including a belt having a first face for rotating said spinners and a second face; and

pneumatic means for forcing said belt drive means into engagement with said spinners, said pneumatic means including a plenum extending lengthwise along said second face of said belt, an inlet communicating with said plenum for supplying compressed air to said plenum, and a plurality of channels communicating with said plenum and said second face of said belt whereby air pressure is exerted on said second face of said belt to drive said spinners.

2. The apparatus as recited in claim **1** wherein said belt means includes a second belt disposed on the opposite side of said spinners from said first belt and moving in a direction opposite to the direction of movement of said first belt, said second belt having a first face for rotating said spinners and a second face, and said pneumatic means includes a second plenum extending lengthwise along said second face of said second belt, a second inlet communicating with said second plenum for supplying compressed air to said second plenum, and a plurality of second channels communicating with said plenum and said second face of said second belt whereby air pressure is exerted on said second face of said second belt to drive said spinners.

3. The apparatus as recited in claim **1** wherein said support means includes a pair of holding members for each of said spinners, each of said holding members including a pair of arms extending transversely from said belt and from the longitudinal axes of said spinners to provide bearings for said spinners.

4. The apparatus as recited in claim **1** wherein said spinners are supported within 2 centimeters of each other.