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(71) Applicant:
Murata Kikai Kabushiki Kaisha
Minami-ku, Kyoto-shi, Kyoto 601 (JP)

(72) Inventors:
- **Inoue, Kouji**
  Nagaokakyo-shi, Kyoto (JP)
- **Tone, Shoichi**
  Sakyo-ku, Kyoto-shi, Kyoto (JP)

(74) Representative:
Liedl, Christine, Dipl.-Chem. et al
Albert-Rosshaupter-Strasse 65
81369 München (DE)

(54) Disc for simultaneous SZ false twisting

(57) A disc for simultaneous SZ false twisting able to stabilize the twist.

A disc for simultaneous SZ false twisting arranged with a a ring shaped elastic member forming a first friction surface and second friction surface on either side of the outer periphery of the disc and which imparts a false twist in opposite directions in a pair of yarns at each of the first friction surface and second friction surface, wherein each of the first friction surface and second friction surface of the elastic member are convex shaped.

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Description

Field of the Invention

The present invention relates to a disc for simultaneous SZ false twisting used in a SZ false twisting and more particularly, relates to a device for making the contact pressure on the yarns uniform.

Background of the Invention

A SZ simultaneous false twister is known where two yarns are doubled and wound after being applied with an S twist and Z twist respectively. A non-torque yarn is obtained where the torque of the S-twist and torque of the Z-twist are cancelled out, the unwinding properties and selvedge of the yarn improve and an increase in operating speed of the subsequent process and decrease in the number of stationary machines can be expected.

This kind of SZ simultaneous false twister comprises the independent adjacent positioning of a false twist device that imparts an S-twist and a false twist device that imparts an Z-twist. A typical example of this kind of false twister is the running of a pair of belt members in different direction at right angles to each other and the imparting of a false twist in the yarn by the contact surface (nip surface) of the cross over part.

However, by positioning independent false twist devices adjacent to each other, the false twist device increases in size. Due to this, a compact false twist device has been proposed where a ring shaped elastic member comprising a first friction surface and second friction surface on either side of the outer periphery of a disc and the arrangement of a pair of false twist members against each of the first friction surface and second friction surface.

One example of this kind of false twist device will be described with reference to Figure 6. In the drawing, the false twist device comprises a disc for simultaneous SZ false twisting 101, a first false twist member 2 and a second false twist member 3.

The disc for simultaneous SZ false twisting 101 is arranged with a first friction ring member 103 and a second friction ring member 104 on either side of the outer periphery of the disc 102. The first false twist member 2 and second false twist member 3 have the same construction and are wound with a continuous belt member 21 between a drive pulley 22 and a free pulley 23.

The belt member 21 of the second false twist member 3 and the tangential direction of the second friction ring member 104 are positioned such that the cross over angle is θ. This second friction ring member 104 rotates in the direction of arrow 51 and as the belt member 23 runs in the direction of arrow 52, the cross over part forms contact surfaces (nip surfaces) that move in opposite direction to each other enabling a twist to be imparted in the yarn.

It should be noted that the first false twist member 2 is of similar arrangement.

Also, the pair of yarns Y1, Y2 are inserted in the contact surfaces (nip surfaces) along the bisector of the angle θ as shown by arrow 53, an S-twist is imparted in yarn Y1, a Z-twist is imparted in yarn Y2 and the two are doubled in a position separated from the disc for simultaneous SZ false twisting 101 producing a single yarn Y3 pulled in the direction of arrow 54.

A false twister using the above mentioned disc for simultaneous SZ false twisting 101, the first false twist member 2 and second false twist member 3 forms a compact device and excels due to the fact that the running path of the yarn is very simple with this device. However, compared to normal false twisters which cross over the belts members 21 of the first false twist member 2 and second false twist member 3, the twist easily becomes unstable and there are limitations on the twist count and the like.

Summary of the Invention

In order to solve the causes of twist instability, it is an aim of the present invention to propose a disc for simultaneous SZ false twisting that is able to achieve a stable twist using the knowledge that the shape of the friction ring member of the disc for simultaneous SZ false twisting is important.

In order to achieve the above mentioned aim, a first aspect of the present invention is a disc for simultaneous SZ false twisting arranged with a a ring shaped elastic member forming a first friction surface and second friction surface on either side of the outer periphery of the disc and which imparts a false twist in opposite directions in a pair of yarns at each of the first friction surface and second friction surface, wherein each of the first friction surface and second friction surface of the elastic member are convex shaped.

A pair of false twist members are able to contact the first friction surface and second friction surface respectively and a false twist is imparted in opposite direction in a pair of yams by this contact surface (nip surface). However, compared to discs, the false twist member more easily flexes and the contact pressure of the contact surfaces more easily becomes uneven but by making each of the first friction surface and second friction surface convex shaped with prior reference to the flexion of the false twist member, the contact pressure becomes uniform.

A typical example of the false twist members are belt members but as belt members are wound around a pair of pulleys and contact the first and second friction surfaces, the contact pressure of the contact surfaces easily becomes unstable by the curve or hollow of the belt members thus convex shaped first and second friction surfaces supplement the hollow of the belt members and ensure uniform contact surfaces.

In short, it is preferable for the degree of convex shape of the first and second friction surfaces to be enough to supplement any deformation of the false twist

member with respect to the friction surfaces.

Furthermore, a pair of belt members which are able to contact a first friction surface and second friction surface respectively and where the width of the first friction surface and second friction surface of the elastic member is approximately the same as the width of the aforementioned belt members. Accordingly, the contact surface produced by the friction surfaces and belt members is of a balanced shape.

Yet further, the elastic member has a concave cross section that fits with the outer periphery of the disc. Accordingly, the positioning of the elastic member on the disc is simple.

Brief Description of the Drawing

Figure 1 is a drawing showing the structure of the disc for simultaneous SZ false twisting of the present invention.

Figure 2 is a drawing showing the operations of the disc for simultaneous SZ false twisting of the present invention.

Figure 3 is a device construction of the false twister using the disc for simultaneous SZ false twisting of the present invention.

Figure 4 is a graph showing the performance of the disc for simultaneous SZ false twisting of the present invention.

Figure 5 is a graph showing the performance of the disc for simultaneous SZ false twisting of the present invention.

Figure 6 is a drawing showing the structure of a conventional disc for simultaneous SZ false twisting.

Detailed Description of the Preferred Embodiments

Hereafter, an embodiment of the present invention will be described using the drawings.

Figure 1A is a cross section of a disc for simultaneous SZ false twisting 1 and Figure 1B is side view of the disc for simultaneous SZ false twisting 1.

The disc for simultaneous SZ false twisting 1 comprises a disc 4 and elastic member 5 having a concave cross section in a state where it is fitted to the outer periphery of the disc 4. The disc 4 is formed as rigid body such as a metal disc or the like and the elastic member 5 is an elastic body such as synthetic rubber or natural rubber or the like. The disc 4 and elastic member 5 are fixed by fitting as a result of heat attachment, adhesion or their concave cross section.

The part along both side surfaces of the elastic member 5 of the outer periphery of the disc 4 forms a first friction surface 11 and second friction surface 12. The false twist device is formed by a first false twist member 2 being positioned against the first friction member 11 and a second false twist member 3 being positioned against the second friction member 12. The arrangement of the first false twist member 2 and second false twist member 3 is similar to that described as in Figure 6 and the description of such is omitted as it has the same numbering.

In particular, the cross section of the first friction surface 11 and second friction surface 12 are not flat parallel surfaces but form a convex shape having a curve of radius R. This convex shape is symmetrical to the left and right of the center of the thicker direction of the disc 4 and for example, is formed by the abrasion of a whetstone 13 having a convex shape. In the drawing, the elastic member 5 is fixed to the disc 4 by heating. A device preprepared with raw rubber in a concave shape is fitted onto the disc 4 and baking is performed on the disc 4 at the same time as vulcanization by heat and pressure application. Thereafter, the first friction surface 11 and second friction surface 12 are formed by abrasion by a whetstone 13.

Furthermore, the surface 55 of the inner peripheral side and surface 56 of the outer peripheral side of the elastic member 5 are processed by grinding and formed to an elastic member 5 having a predetermined inner and outer diameter and predetermined width W1. If the cross section is concave shaped, the processing of the surface of the outer peripheral side is also simple.

It should be noted that it is preferable for the distance δ between the outer peripheral surface 56 of the elastic member 5 and the outer peripheral surface of the disc 4 to be as small as possible. The reason for this is so the first friction surface 11 and second friction surface 12 may be reliably formed. As a result, the dimensions of each member are adjusted so that δ is from 0.5mm to 2mm.

Figure 1B shows a false twist device being a combination of the disc for simultaneous SZ false twisting 1 and the first and second false twist members 2, 3. It is preferable for the width W2 of the belt member 21 of the first and second false twist members 2, 3 to be approximately the same as the width W1 of the elastic member 5.

It should be noted that the positional relationship between the yarns Y1, Y2, Y3 and the disc for simultaneous SZ false twisting 1 and the first and second false twist members 2, 3 is similar to that described in Figure 6 and specific details are omitted as they have the same numbering.

Next, the movements of the disc for simultaneous SZ false twisting 1 will be described using Figure 2.

The belt member 21 of the first false twist member 2 is in contact with the first friction surface 11 of the disc for simultaneous SZ false twisting 1 at an angle and form a first contact surface (nip surface) 14. Similarly, the belt member 21 of the second false twist member 3 is in contact with the second friction surface 12 and form a second contact surface (nip surface) 15.

The belt member 21 is stretched between pulleys 22, 23 at a predetermined tension and as there is not support midway, flexion develops. As the first friction surface 11 and second friction surface 12 are formed in convex shapes of radius R in order to counteract this flexion, the dispersion of the contact pressure between

the surfaces of the first contact surface 14 and second contact surface 15 is reduced. As a result, the yarn twisted by the first contact surface 14 and second contact surface 15 receives a stable twist application.

In short, it is preferable for the convex shape of the first friction surface 11 and the second friction surface 12 to be decided corresponding to the deformation of the respective false twist members. When both pulleys 22, 23 are long and the tension of the belt members is low, the convex part becomes a more projecting shape. When the deformation of the false twist members is small, the convex shape is also small.

It should be noted that the convex shape is only to counteract the flexion of the false twist members, is not limited to the arc-shape of radius R, and may be parabolic, elliptical or angular.

Furthermore, as shown Figure 1B, as the width W1 of the first friction surface 11 and the second friction surface 12 is approximately the same as the width W2 of the belt member 21 of the first and second false twist members 2, 3, the contact surfaces 14, 15 resemble a rhombus. Due to this, a twist insufficiency due to width W1 being too small or a decrease in the lifespan of the belt member 21 due to the width W1 being too large is prevented.

Next, an example of an arrangement of a false twist device using a combination of the disc for simultaneous SZ false twisting 1 and the first and second false twist members 2, 3 will be described using Figure 3.

The yarn Y1 from a first POY and the yarn Y2 from a second POY are pulled by a first feed roller FR1. From downstream, a heater H1 and false twist device 31 are sequentially positioned between the first feed roller FR1 and a second feed roller FR2.

It should be noted that the peripheral speed of the second feed roller FR2 is higher than the peripheral speed of the first feed roller FR1 and drawing occurs between the two. The yams Y1,Y2 between the false twist device 31 and first feed roller FR1 are in a twisted state and the twist is heat fixed by the heater H1. The yarns Y1,Y2 between the false twist device 31 and second feed roller FR2 are in an untwisted state and are pulled by the second feed roller FR2 while being combined. Also, the filaments of the two yarns Y1,Y2 are entangled at nozzle I/L forming a single yarn Y3 wound onto DTY. Due to this, the torques of the S-twist yarn and Z-twist yarn are completely removed and a non-torque yarn is produced.

Example:

The performance of the disc for simultaneous SZ false twisting will be confirmed hereafter by a false twister as in Figure 3.

Draw texturizing of a 150d/36f yarn was performed with a yarn speed of 800m/min and a speed ratio between the first feed roller FR1 and second feed roller FR2 of 1.60. The material of the elastic member 5 was synthetic rubber having a width W1 of 8mm and a diameter of 178mm. The material of the belt member 21 of the first and second false twist member 2, 3 opposing the elastic member 5 was synthetic rubber with a width W1 of 8mm and a thickness of 1.6mm. Also, the cross over angle θ of the tangential direction of the elastic member 5 and the belt member 21 was 105 ° .

Furthermore, in the current example, the first friction member 11 and second friction member 12 of the elastic member 5 had a convex shape with radius R=40mm and the flat first friction member 11 and second friction member 12 of the elastic member 5 were used as a control.

The results of investigating how the tension (T_2 tension) of the untwisting side of the yarn when changing VR (Running speed of the belt member 21/Peripheral speed of the second feed roller FR2) from 1.42 to 1.57 are shown in Figure 4. In the control, the T_2 tension remained high and the T_2 tension did not decrease much even on increasing the VR. In contrast with this, the present example had a T_2 tension 70% lower than the control even at a VR of 1.42, increasing VR produced a sudden decrease in T_2 tension and at VR = 1.57, it had decreased to 30% of the control. The decrease in T_2 tension with changing VR means that the twist is more stable. Incidentally, the properties of a conventional false twist device which crosses over belt members is shown by the dotted line and has similar properties to the present example.

Furthermore, when the aforementioned VR was similarly changed between 1.42 and 1.57, the results of investigating the change in twist count (number of twists per 1 meter) are shown in Figure 5. The control twist count remained between 2500-2650 and did not increase a great deal even on increasing VR. In contrast with this, the present example increased from 2800 to 3100 with an increase in VR.

As described above, it is understood that the performance of a disc for simultaneous SZ false twisting changes greatly with a slight convex shaped first friction surface 11 and second friction surface 12 of the elastic member 5.

As described above, as the false twist members (for example belt members) that contact each of the first and second friction surfaces is formed into a convex shape in order to counteract the flexion, the contact pressure of the contact surfaces which impart a twist in the yarn becomes uniform and a false twist having a stable tension is imparted. Specifically, the untwisting side tension (T_2 tension) decreases, the twist count can be increased and the generation of untwisted parts can be decreased.

Furthermore, a decrease in twist application performance by the width of the first and second friction surfaces being too small compared to the width of the belt members, or a decrease in the lifespan of the belt member by excessive friction by the width being too large can be prevented.

Yet further, the elastic member may be easily attached to the outer periphery of the disc and a high

precision disc for simultaneous SZ false twisting can be produced at low cost.

Claims

1. A disc for simultaneous SZ false twisting arranged with a ring shaped elastic member forming a first friction surface and second friction surface on each side of the outer periphery of the disc and which imparts a false twist in opposite directions in a pair of yarns at each of the first friction surface and second friction surface, wherein

   each of the first friction surface and second friction surface of the elastic member are convex shaped.

2. A disc for simultaneous SZ false twisting as in claim 1, wherein a pair of belt members is able to contact each of the first friction surface and second friction surface and the widths of the first friction surface and second friction surface of the elastic member are approximately the same as the width of belt member.

3. A disc for simultaneous SZ false twisting as in claims 1 or 2, wherein the elastic member has a concave cross section to fit on the outer periphery of the disc.

FIG. 1B

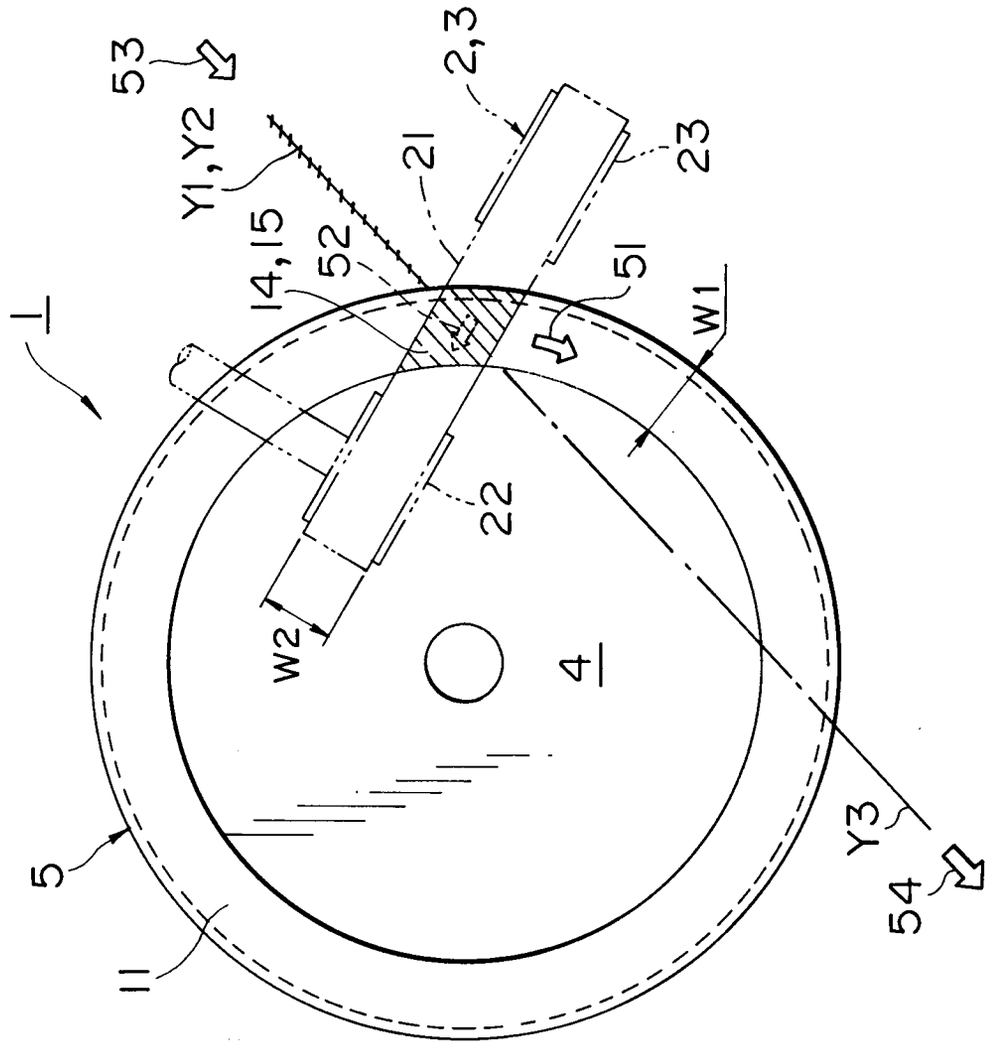
53
2,3
Y1,Y2
21
23
14,15
52
51
W1
1
22
W2
4
5
11
Y3
54

FIG. 1A

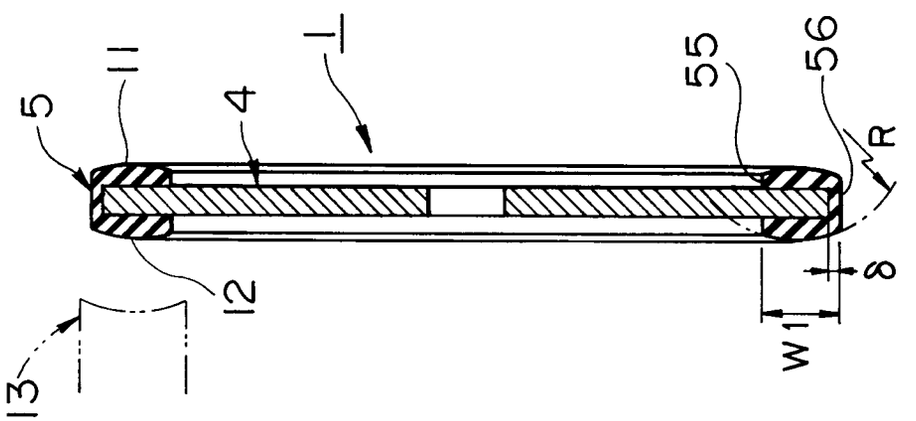
5
11
4
1
55
56
R
δ
12
13
W1

FIG. 2

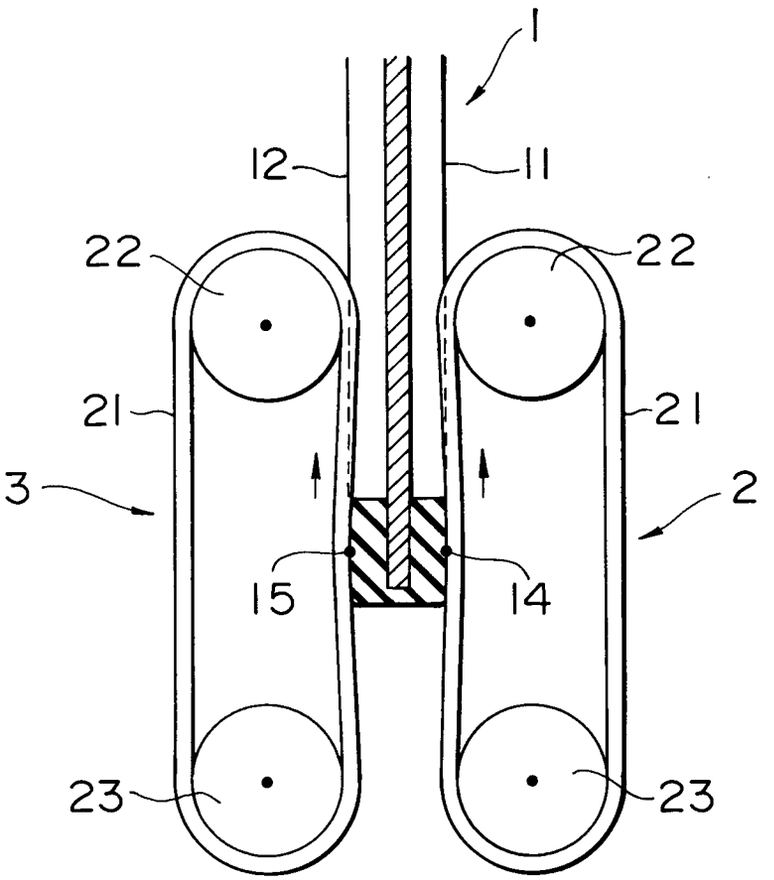

FIG. 3

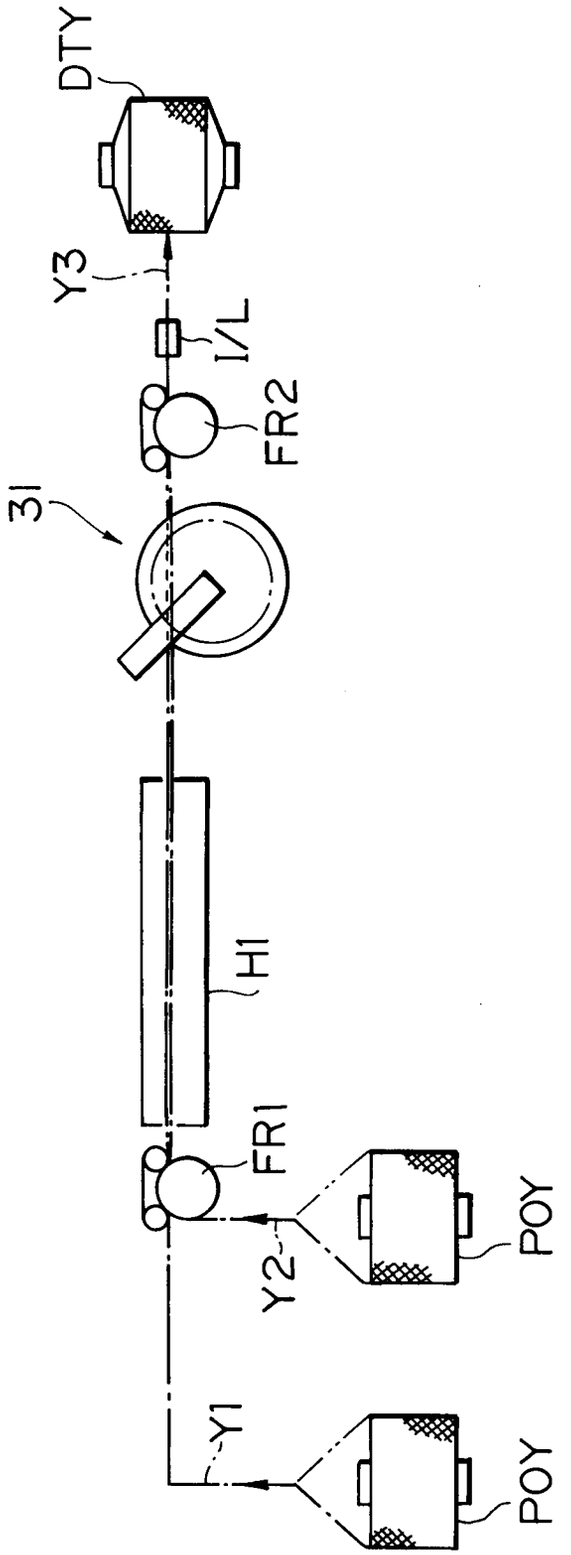

FIG. 4

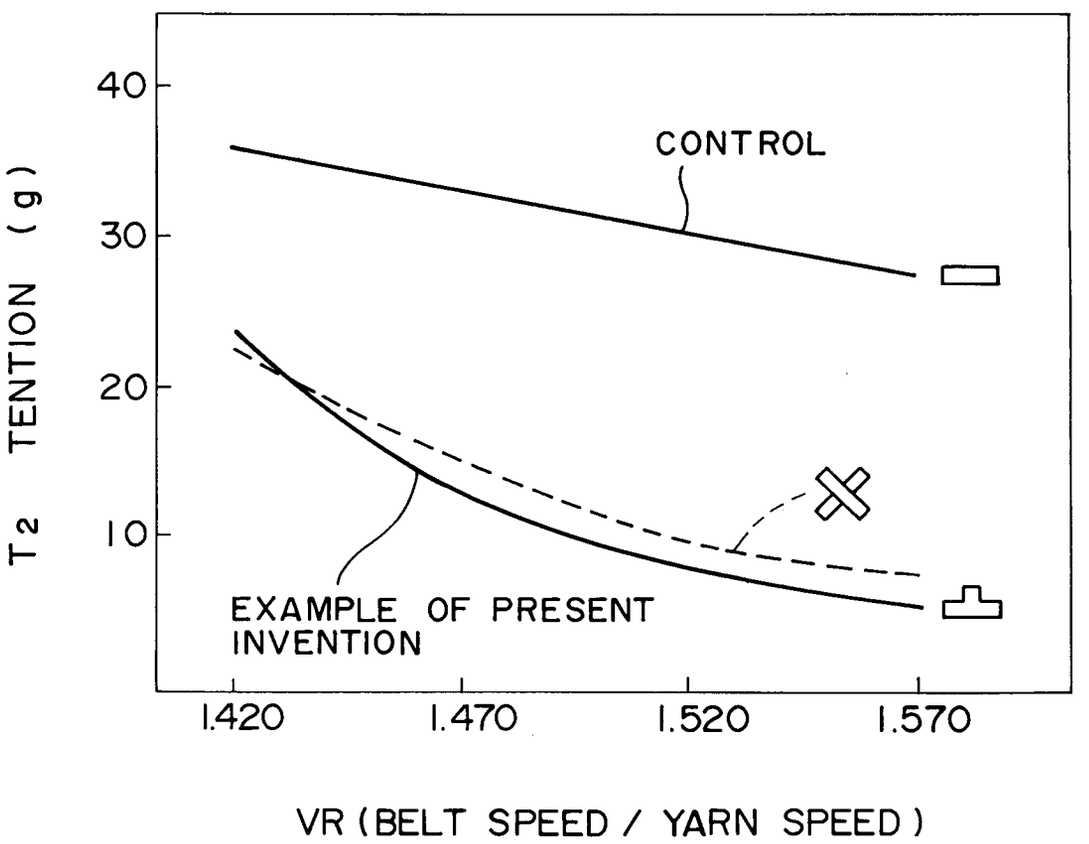
40
30
20
10
T2 TENTION (g)
CONTROL
EXAMPLE OF PRESENT INVENTION
1.420
1.470
1.520
1.570
VR (BELT SPEED / YARN SPEED)

FIG. 5

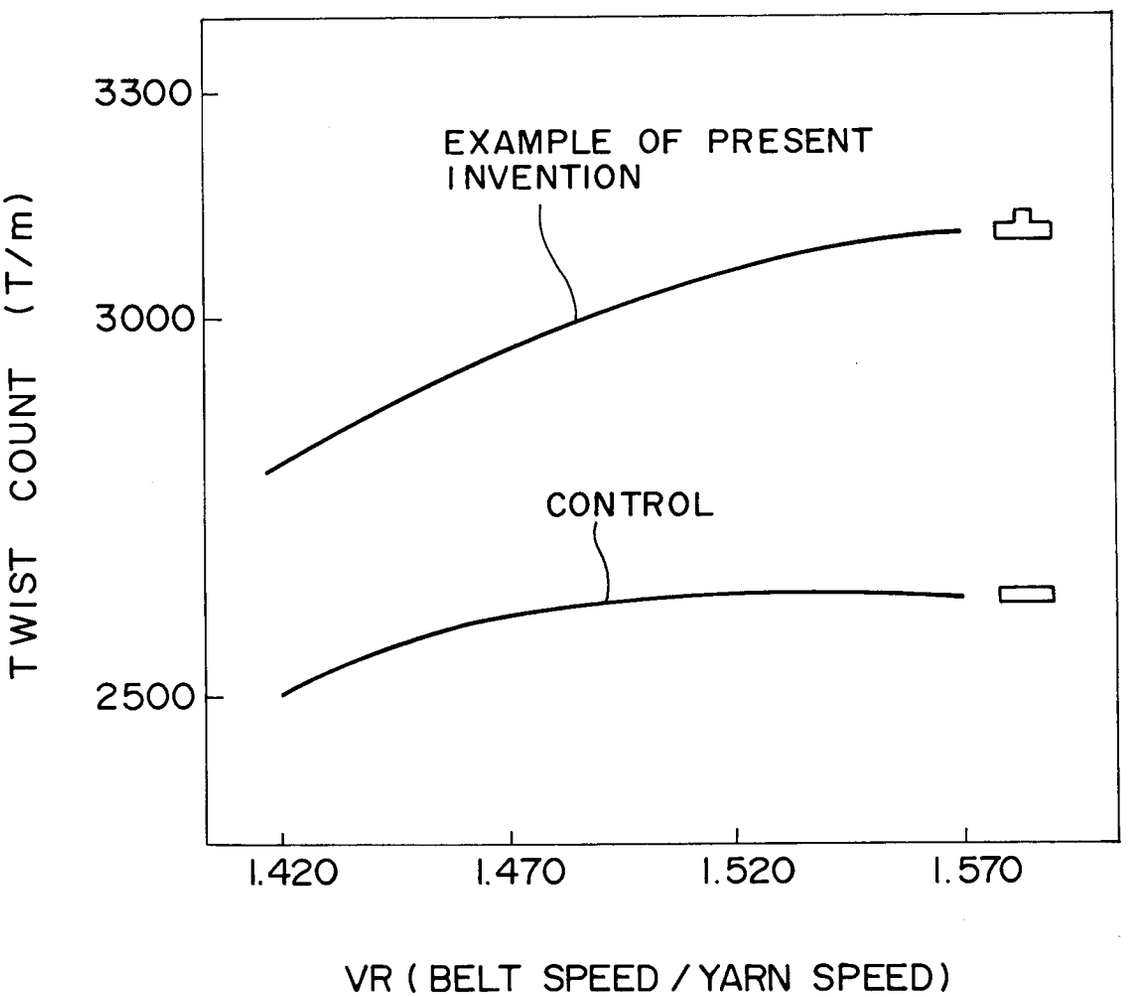
3300
3000
2500
TWIST COUNT (T/m)
EXAMPLE OF PRESENT INVENTION
CONTROL
1.420
1.470
1.520
1.570
VR (BELT SPEED / YARN SPEED)

FIG. 6