United States Patent [19]

Knebel

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[54] **FALSE-TWIST DEVICE**

[75] Inventor: **Gustav Knebel,** Dubendorf, Switzerland

[73] Assignee: **Heberlein & Co. AG,** Wattwil, Switzerland

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[52] **U.S. Cl.** **57/77.4,** 57/77.45

[51] **Int. Cl.** **D01h 7/92,** D02g 1/08

[58] **Field of Search** 57/77.4, 77.42, 77.45, 57/51.6

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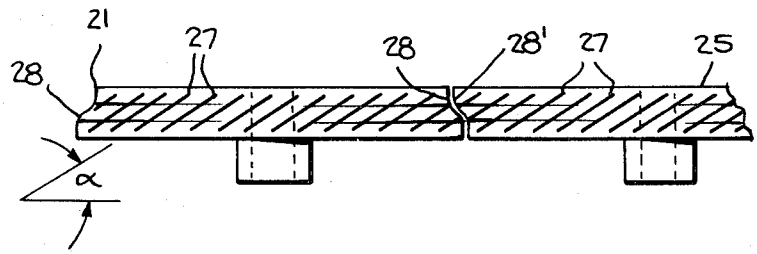
Primary Examiner—John W. Huckert
Assistant Examiner—Charles Gorenstein
Attorney, Agent, or Firm—Fitzpatrick, Cella, Harper & Scinto

[57] **ABSTRACT**

False-twist device for textile yarns has circular discs arranged on parallel shafts, four such shafts being provided, opposite shafts having at the same level discs formed with configurations extending at any angle relative to the discs surfaces and with profiles of pairs of discs at the same level in mutual engagement.

9 Claims, 7 Drawing Figures



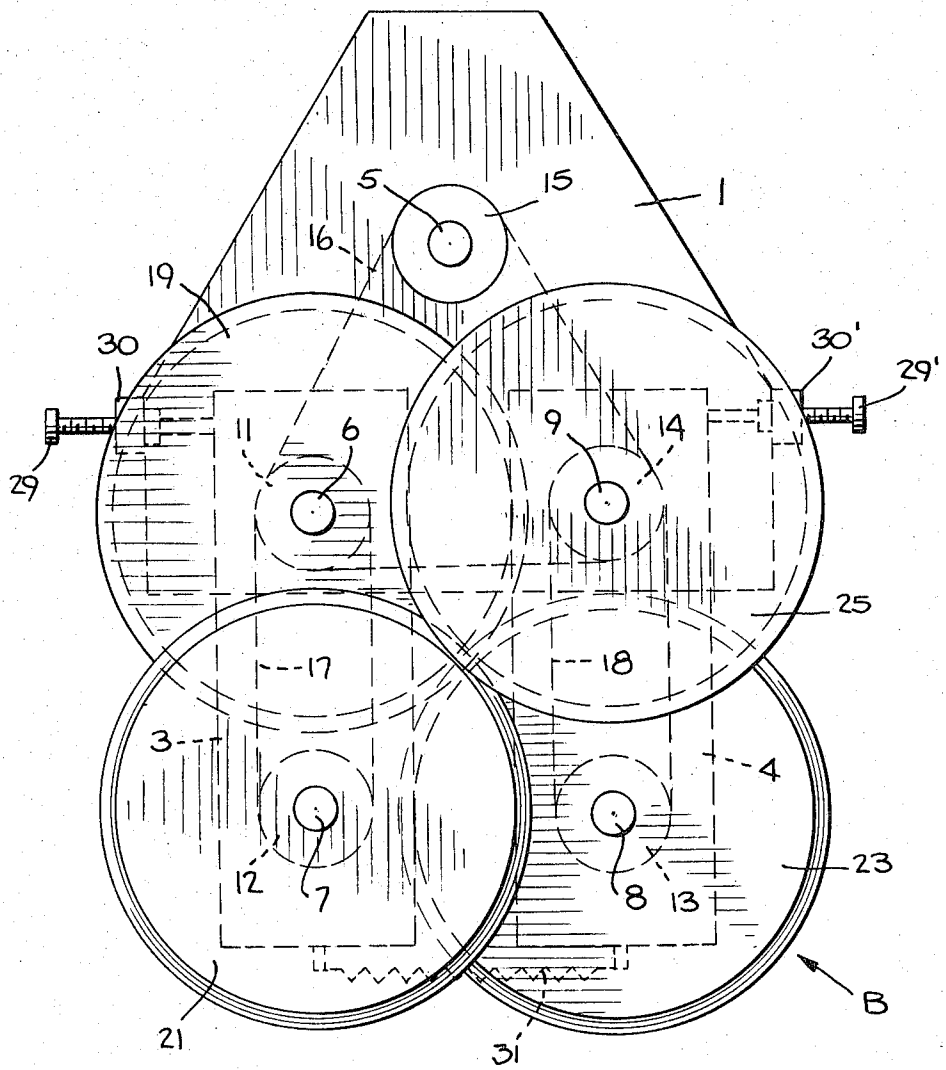

5
15
1
16
19
30
30'
29'
29
11
6
9
14
25
17
18
3
4
12
7
8
13
23
21
31
B

Fig. 1.

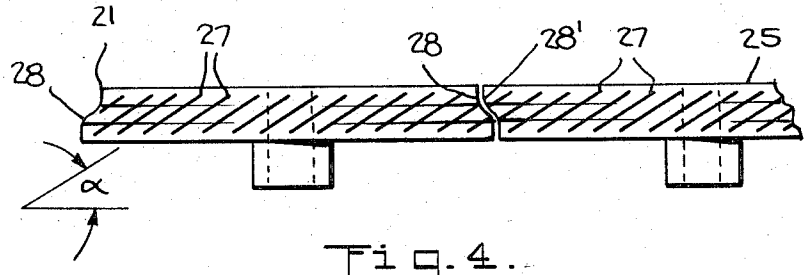

21
27
28
28'
27
25
28
α

Fig. 4.

Fig. 2.

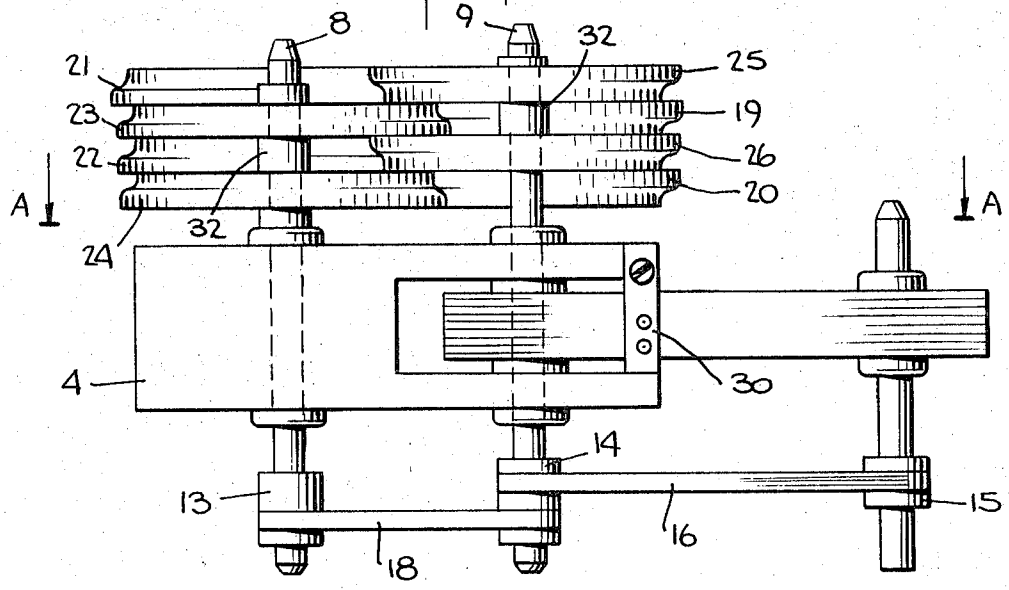
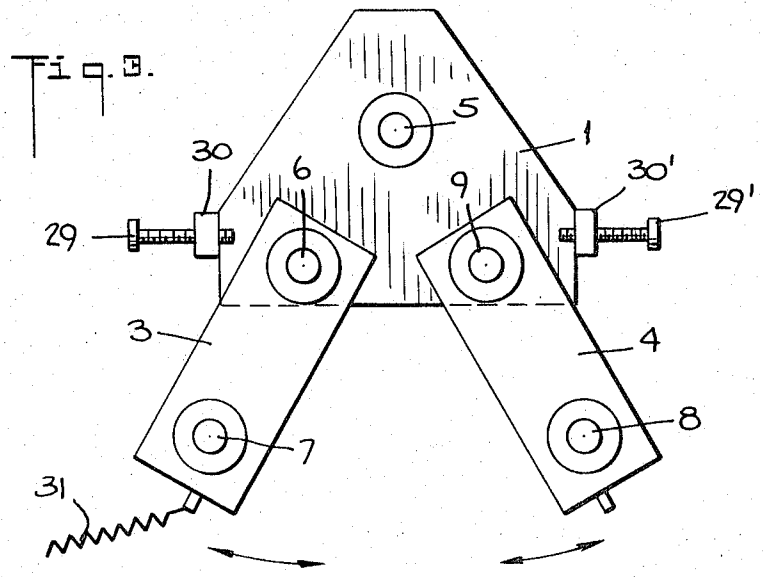


Fig. 3.



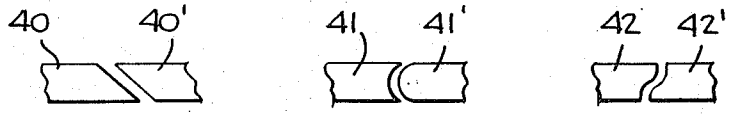


Fig. 5A. Fig. 5B. Fig. 5C.

FALSE-TWIST DEVICE

This invention relates to false-twist devices for textile yarns, and more particularly to such devices which impart a forward movement to the yarn while false-twisting it.

Devices for the false-twisting of textile yarns are known by means of which twist is imparted to the yarn by direct frictional contact with rotating surfaces. Thus, for example, a device is known from British Pat. specification No. 933,438 in which a number of circular discs are arranged on each of three parallel rotation shafts at certain distances so that their rims overlap, the discs being so arranged on each rotation shaft that they engage with the interstices between the discs of the other rotation shafts.

In the known false-twist devices of this type, for imparting the twist, a certain pre-tension of the yarn is necessary to press the same against the friction body. The force transmitted to the yarn by the friction body in this case acts against the direction of movement of the yarn which may cause very high differences in tension between the yarn ahead of the twist imparter and that following it.

I have conceived a device of the class described by which I am able to eliminate the foregoing difficulty. Thus, I contribute a friction false-twist device for textile yarns with circular discs arranged on parallel rotatable shafts at certain distances and characterized in that four shafts arranged in the corners of a square are provided, and in that on the shafts situated opposite each other across the square, the discs are arranged on the same level; that furthermore, the disc rims are provided with grooves or projections extending at an ascending angle with respect to the disc surfaces and with profiles, and that the disc rim profiles of the two discs arranged on the same level are in mutual engagement.

There has thus been outlined rather broadly the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of the invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of the invention.

Specific embodiments of the invention have been chosen for purposes of illustration and description, and are shown in the accompanying drawings, forming a part of the specification wherein:

FIG. 1 is a top view of a device according to my invention;

FIG. 2 is a lateral elevation of the device of FIG. 1;

FIG. 3 is a cross-sectional view taken along line A—A of FIG. 2;

FIG. 4 is a lateral elevation of two discs in the direction of arrow B of FIG. 1; and

FIGS. 5A–C illustrate various embodiments of a detail of the invention.

According to FIGS. 1 and 2, a carrier plate 1, fixed in a manner not shown on the machine frame, engages with the forked recesses of two rectangular carriers 3, 4. Shafts 5, 6, 7, 8 and 9 extend through perforations in the carrier plate 1 and carriers 3 and 4 and are supported for rotation therein. The shafts 6–9 are arranged so as to lie in the corners of an imaginary square, as viewed in FIG. 1. Below the carriers 3 and 4, on the respective shafts 6, 7, 8 and 9, I provide pulleys 11, 12, 13 and 14; and below plate 1 on shaft 5, a pulley 15. The pulleys 11, 14 and 15 carry endless belt 16; pulleys 11 and 12 carry endless belt 17; and pulleys 13 and 14 carry endless belt 18. The shaft 5 is driven by a motor (not shown). Furthermore, the carrier 3 can be swivelled about shaft 6 and carrier 4 about shaft 9 so that the device can be opened in the way shown in FIG. 3 to permit insertion and removal of the yarn. The carriers 3 and 4 are kept together by spring 31 when the device is closed.

On each of the shafts 6, 7, 8 and 9, I provide two discs 19,20; 21,22; 23,24; 25,26; respectively, and these are separated from each other by spacers 32 which may be exchanged to vary the axial distance between discs. All the disc rims have grooves 27 extending obliquely with respect to the discs surface and having, for example, a width of 0.5 mm. and profiles which are in mutual engagement on the discs 21 and 25, 19 and 23, 33 and 26, 20 and 24 situated on the same level, as can be seen in FIG. 4.

Fine adjustment of the gap between the profiles of the disc rims according to the thickness of the yarn to be treated, can be effected by means of adjusting screws 29 and 29′ which are provided in the threaded bores of the parts 30 and 30′ provided on the carrier plate 1 and which act on carriers 3 and 4.

The discs are arranged on the rotatable shafts at minimum distances from each other, assuring unimpeded rotation. These distances can, depending on the thickness of the yarn to be treated, amount to between 0.2 and 1 mm. They can be adjusted by insertion of corresponding spacers between the individual discs.

The mutually engaging profiles of the rims of the discs situated on the same level and the small mutual distances between the discs in axial direction, cause the passing yarn to be pinched without a possibility of escaping, whereby twist imparting is effected practically without slippage. The oblique grooves 27 at the same time contribute a forward movement to the yarn in its advancing direction.

The grooves 27 may, for example, extend at an angle α of the order of $30° \pm 5°$ with respect to the disc surface. It has proven advantageous successively slightly to increase the angle α of the grooves from the uppermost to the lowermost disc if the yarn moves downwards and the discs rotate counterclockwise as viewed in FIG. 1, i.e., the angle may, for example, be 30° on discs 21 and 25; 31° on discs 19 and 23; 32° on discs 22 and 26; and 33° on discs 20 and 24. In this case, the biggest angle provides the highest yarn advance rate, and the described escalation of the angles contributes to avoid yarn accumulation between the discs. Instead of obliquely extending grooves, the disc rims may also carry corresponding projections. Furthermore, the grooves or projections may be of the same width as their mutual distances. The angle α furthermore depends on the friction coefficient of the disc material and may even amount to more than 35°.

The mutually engaging profiles of the disc rims may also be of other shape than as shown in FIGS. **2** and **4**, such, for example, as the shapes **40,40'**; **41,41'**; and **42,42'** shown in FIGS. **5**A-C.

The discs may consist of a material having high wear resistance and, at the same time, a friction coefficient with respect to synthetic yarn material such as polyamides or polyester as high as possible and may, for example, consist of metal oxide ceramic material or aluminum discs may be provided at least on the rims with a oxide coating. It is furthermore possible to use discs of hard-chromed aluminum.

The primary advantage of the device according to the present invention, consists in that the ratio between yarn tensions, before entering into and after leaving the twist imparter formed by the discs, is relatively small; and in that at the same time an important advance movement in its direction of movement is imparted to the yarn.

This progressive effect is provided by means of the comparative examples described hereinafter.

Two multifilament yarns of polyamide **66** (poly hexamethylene adipamide) of various titers were subjected to a false-twisting treatment using a model (I) of the device of the present invention. For comparison, the false twist was furthermore imparted by two models with similar arrangement of the discs, one of the models (II) having profiles on the rims, but no grooves or projections, and the other model (III) having straight disc rims but grooves. The results shown in the following table illustrate that only when using discs, the rims of which have profiles and grooves or projections, is the described effect obtained.

TABLE

Twist Imparter	Model I		Model II		Model III	
Yarn titer dtex	78/23	156/46	78/23	156/46	78/23	156/46
Disc circumferential speed in m/min.	345	345	345	345	345	345
Yarn delivery speed in m/min.	100	100	100	100	100	100
Yarn tension before twist imparter p	7	15	3	3	3	3
Yarn tension after twist imparter p	12	24	26	20	24	27
Tension ratio	1:1.7	1:1.6	1:8.7	1:6.7	1:8	1:9

I believe that the construction and operation of my novel false-twist device will now be understood, and that its advantages will be fully appreciated by those persons skilled in the art.

I claim:

1. False-twist device for textile yarn with circular discs arranged on parallel rotatable shafts, characterized in that four such shafts (**6,7,8,9**) are provided the axes of which are at the corners of an imaginary square, and in that on the shafts (**6,8**; **7,9**) situated diagonally opposite each other, the discs (**19,20,23,24**; **21,22,25,26**) are arranged on the same level, the disc rims being provided with configurations (**27**) extending at an ascending angle α with respect to the disc surfaces and with profiles (**40,40'**; **41,41'**; **42,42'**) and that the disc rim profiles of discs arranged on the same level are complimentary.

2. Device according to claim **1**, characterized in that the discs are arranged on the rotatable shafts in immediate proximity to one another consistent with unimpeded rotation.

3. Device according to claim **2**, characterized in that the axial disc distances are adjustable by means of exchangeable spacers of different axial lengths.

4. Device according to claim **1**, characterized in that the ascending angle α of the grooves or projections increases by between 1° and 3° for each subsequent disc in direction of yarn movement.

5. Device according to claim **1**, characterized in that the ascending angle α of the grooves or projections (**27**) is of the order of $30° \pm 5°$.

6. Device according to claim **1**, characterized in that the discs consist of metal oxide ceramic material.

7. Device according to claim **1**, characterized in that the discs consist of aluminum and are provided at least on the rims with an oxide coating.

8. Device according to claim **1**, characterized by two carriers (**3,4**) each supporting a pair of adjacent shafts (**6,7**; **8,9**), at least one of said carriers being arranged to pivot relatively to the other of said carriers.

9. Device according to claim **8**, characterized in that said one carrier is pivotable about the axis of one of the shafts supported by it.

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