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[54] **TWISTING OF TEXTILE FILAMENTS**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.** **D02g 1/02,** D02g 1/04

[58] **Field of Search** .... 57/77.3, 77.4, 77.45, 157 TS

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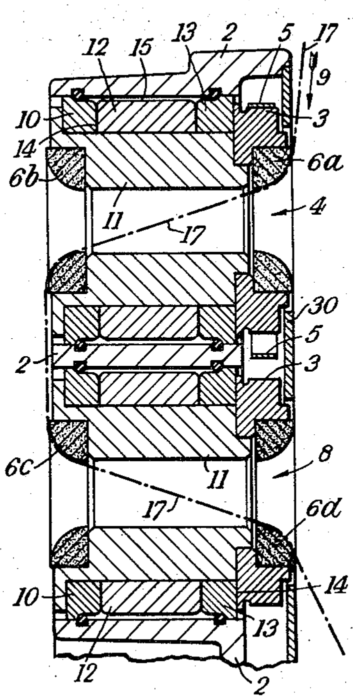
[57] **ABSTRACT**

Yarn is false twisted by means of a frictional twister having successive yarn contacting surfaces of increasing hardness.

25 Claims, 3 Drawing Figures



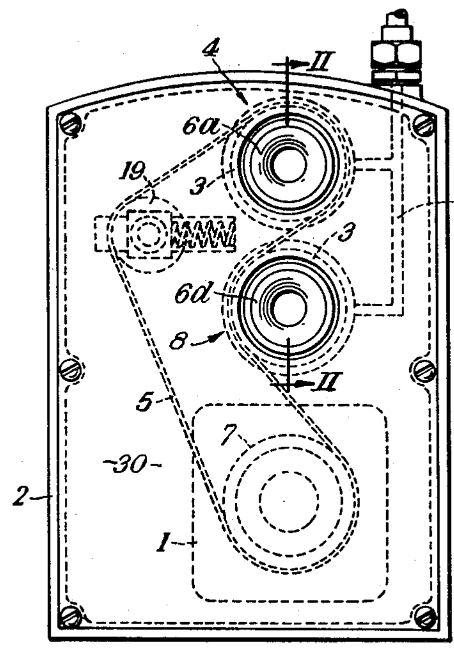


Fig. 1.

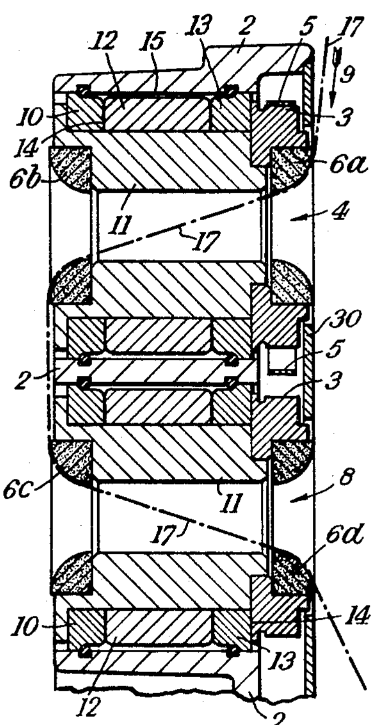


Fig. 2.

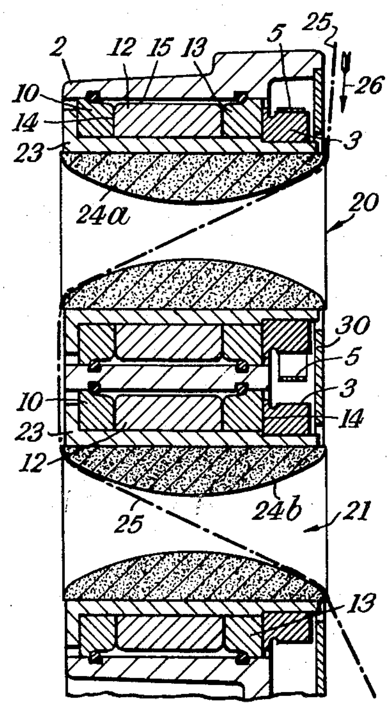


Fig. 3.

TWISTING OF TEXTILE FILAMENTS

The present invention relates to the twisting of textile filaments.

According to a first aspect of the present invention there is provided a method of false twisting synthetic filament yarn wherein the yarn runs in a path in which it contacts in succession two moving deformable twist-imparting surfaces of different hardnesses to false twist the yarn.

According to a second aspect of the present invention there is provided a false twisting arrangement for synethetic filament yarn comprising two deformable twist imparting surfaces of different hardnesses which, in use, are contacted in succession by a running synthetic filament yarn and are so arranged to move to impart false twist to the yarn.

Two embodiments of the invention will now be described by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a front elevation of a false twist unit

FIG. 2 is a section on the lines II—II of FIG. 1, showing a first form of false twist arrangement according to the invention

FIG. 3 is a cross-sectional view of a second form of false twist arrangement according to the invention.

Referring to FIG. 1, the false twist unit comprises a frame 2 which rotatably supports upper and lower rotary twist bushes 4 and 8 respectively. The bushes 4, 8 are each provided with a pulley portion 3 and are arranged to be driven in mutually opposite directions by a belt drive 5 which passes round the pullies 3, a motor drive pulley 7 and a spring loaded jockey pulley 19 and is driven by a motor 1.

Referring also to FIG. 2, the bushes 4 and 8 are formed as hollow steel cylinders 11 and are provided with annular rebates at their ends which receive deformable polyurethane rings 6*a*, 6*b*, 6*c*, 6*d* each of quadrant section and so arranged that their curved surfaces form shaped mouths for the bushes. The Shore hardness of the ring 6*b* is 2° greater than that of ring 6*a*, that of ring 6*c* 2° greater than that of ring 6*b* and that of ring 6*d* 2° greater than that of ring 6*c*. The rings 6*a*, 6*b*, 6*c*, 6*d* are colour coded according to their hardness for easy identification.

Each hollow steel cylinder 11 is mounted in an air bearing which, as best seen in FIG. 2, comprises three annular metal rings 10, 12, 13 which surround the hollow metal cylinder 11. The radial walls 14 of the middle ring 12 are roughened to provide a passage for air to pass from a radially outer annular chamber 15 to a radially inner annular gap between the cylinder 11 and the rings 10, 12, 13. Air is supplied to the chamber 15 from a source of air under pressure through pipes 16 in the frame 2.

The front of the frame 2 is covered by a plate 30 which is provided with two holes which register with the twist bushes 4, 8.

In use, the bushes 4 and 8 are rotated in mutually opposite directions. A thermoplastic continuous filament yarn 17 is drawn through the two twist bushes 4 and 8 in the direction indicated by the arrow 9 in FIG. 2. The yarn 17 is at its lowest tension as it enters the upper twist bush 4 and contacts the surface of the least hard ring 6*a*. The tensioned yarn 17 deforms the surface of the ring 6*a* and friction between the surface of the ring 6*a* and the yarn 17 inserts twist into the yarn 17 which then passes diagonally across the bush to contact the surface of the third hardest ring 6*b* where twist is also inserted in the manner described above with reference to the ring 6*a*. After leaving the upper bush 4, the yarn 17 enters the lower bush 8 and contacts the surface of the second hardest ring 6*c* where further twisting takes place. Finally, the yarn passes diagonally across the second busy 8 to contact the surface of the hardest ring 6*d* before leaving the second bush 8. The tension of the yarn 17 increases as it passes through the two twist bushes 4 and 8 and the yarn 17 is at maximum tension as it leaves the lower bush 8.

Referring next to FIG. 3, the upper and lower twist bushes 20, 21 are rotatably mounted in the frame 22 in the manner described with reference to FIGS. 1 and 2. Parts common to FIGS. 1 and 2 and to FIG. 3 bear the same reference numerals are not described in detail.

The upper and lower bushes 20, 21 are formed as hollow steel cylinders 23 which receive cylindrical deformable polyurethane sleeves 24*a*, 24*b* whose wall thickness increases axially from the ends to an axially central portion of maximum thickness. The Shore hardness of the upper sleeve 24*a* is less than the Shore hardness of the lower sleeve 24*b*.

In use, the two twist bushes 20, 21 are rotated in mutually opposite directions by the belt drive 5. A thermoplastic continuous filament yarn 25 is drawn through the two twist bushes 20, 21 in the direction indicated by the arrow 26. The yarn 25 is at its lowest tension as it enters the upper twist bush 20 and contacts the less hard sleeve 24*a*. The friction between the insert 24*a* and the yarn 25 inserts twist in to the yarn 25 which then passes diagonally across the bush 20 to contact the surface of the less hard sleeve 24*a* where twist is also inserted. After leaving the upper bush 20 the yarn 25 enters the lower bush 21 and contacts the surface of the harder sleeve 24*b* where further twisting takes place. Finally, the yarn 25 passes diagonally across the second bush 21 to contact the surface of the harder sleeve 24*b* once again to insert twist. The tension of the yarn 25 increases as it passes through the twist bushes 20, 21 and the yarn is at maximum tension as it leaves the lower bush 21.

It will be appreciated that each sleeve 24*a*, 24*b* may be formed in two cylindrical parts which are in end-to-end abutment. The parts are preferably of differing hardness and arranged so that the first surface of the upper sleeve 24*a* contacted by the yarn 25 is the least hard surface, the next contacted surface the third hardest, the first contacted surface of the lower sleeve 24*b*, the second hardest and the finally contacted surface the hardest.

It will be appreciated that while the embodiments of the invention described above with reference to the drawings include deformable twist imparting surfaces mounted within twist bushes, the surfaces may be mounted otherwise. For example, deformable twist imparting surfaces of different hardnesses may be mounted on the peripheries of two stacks of rotatable discs arranged with their axes parallel. The discs of one stack are axially staggered from and radially overlapping with the discs of the other stack. In use, the discs rotate in mutually opposite directions with the yarn following a serpentine path in contact alternately with the peripheries of the two stacks of discs.

The deformable twist-imparting surfaces described above with reference to the drawings are made of deformable polyurethane. It will be appreciated, however, that other deformable materials such as rubber and suitable elastomers may also be used.

The twist assembly described with reference to the drawings is particularly suitable for incorporation in a texturing machine as described in British Patent Application No. 61237/69.

What we claim is:

1. A method of false twisting a running synthetic filament yarn comprising the step of contacting the running yarn in succession with two moving deformable twist-imparting surfaces of different hardness to false twist the yarn, the second contacted surface being of greater hardness than the first contacted surface.

2. A method according to claim 1 and further comprising contacting the yarn with the two deformable twist imparting surfaces in such a manner that the tension in that part of the yarn contacting the surface of greater hardness is larger than the tension in that part of the yarn contacting the surface of lesser hardness.

3. A method according to claim 1 and further comprising contacting the yarn in succession with two further deformable twist-imparting surfaces of different hardness after contacting the two first-mentioned deformable twist-imparting surfaces, the two further deformable twist-imparting surfaces moving to impart further false twist to the yarn.

4. A method according to claim 3 wherein the two first-mentioned deformable twist-imparting surfaces and the two further deformable twist-imparting surfaces are all of different hardnesses and wherein the yarn contacts the twist-imparting surfaces in succession in order of increasing hardness.

5. A method according to claim 1 wherein the contact of the yarn with the two further deformable twist-imparting surfaces is such that the tension in that part of the yarn contacting the surface of greater hardness is larger than the tension in that part of the yarn contacting the surface of lesser hardness.

6. An arrangement according to claim 1 wherein the rings are colour coded according to their hardness.

7. A false twisting arrangement for synthetic filament yarn comprising two deformable twist-imparting surfaces of different hardness, the yarn contacting the less hard surface before contacting the harder surface and drive means for moving said surfaces to false twist the yarn.

8. An arrangement according to claim 7 wherein the two deformable twist-imparting surfaces are mounted on a rotary twisting element over which the yarn passes and in which the yarn contacts the surfaces.

9. An arrangement according to claim 8 wherein the rotary twisting element comprises a twist bush and wherein the deformable twist-imparting surfaces comprise a ring at each end of the bush which, in use, contacts a yarn running through the bush.

10. An arrangement according to claim 9 wherein each ring is of uniform hardness throughout.

11. An arrangement according to claim 9 wherein the ring of lesser hardness is provided at the yarn entry end of the bush and wherein the ring of greater hardness is provided at the yarn exit end of the bush.

12. An arrangement according to claim 7 and additionally comprising two further deformable twist-imparting surfaces of different hardnesses which, in use are contacted in succession after the two first-mentioned deformable twist inducing surfaces by the yarn and which move to impart further false twist to the yarn.

13. An arrangement according to claim 12 wherein the two further twist-imparting surfaces are positioned relative to the direction of travel of the yarn so that the tension of the yarn contacting the surface of greater hardness is larger than the tension of the yarn contacting the twist-imparting surface of lesser hardness.

14. An arrangement according to claim 13 wherein the first-mentioned twist imparting surfaces and the further twist-imparting surfaces are all of different hardnesses and wherein the yarn contacts the twist imparting surfaces in succession in order of increasing hardness and in order of increasing yarn tension.

15. An arrangement according to claim 12 wherein the two further deformable twist-imparting surfaces are mounted on a rotary twisting element through which the yarn passes and in which the yarn contacts the surfaces.

16. An arrangement according to claim 15 wherein the rotary twisting element comprises a twist bush and wherein the further deformable twist imparting surfaces comprises two further rings one at each end of the bush and which, in use, contact the yarn running through the bush.

17. An arrangement according to claim 16 wherein, in use, the tension of the yarn increases as it runs through the bush and wherein the further ring of lesser hardness is provided at the yarn entry end of the bush and wherein the further ring of greater hardness is provided at the yarn exit end of the bush.

18. An arrangement according to claim 7 wherein each ring is formed of an elastomeric material.

19. An arrangement according to claim 7 wherein the two deformable twist-imparting surfaces are positioned relative to the direction of travel of the yarn so that the tension of the part of the yarn contacting the surface of greater hardness is larger than the tension of the part of the yarn contacting the surface of lesser hardness.

20. An arrangement according to claim 7 wherein each ring is of quadrant cross-section.

21. An arrangement according to claim 7 wherein one of the two deformable twist imparting surfaces is mounted in a first rotary twisting element and the other deformable twist imparting surface is mounted in a second rotary twisting element, the yarn, in use, running through or over the first and second elements in succession to contact the two deformable twist-imparting surfaces.

22. An arrangement according to claim 21 wherein each rotary twisting element comprises a twist bush and wherein each deformable friction imparting surface is formed as an annular sleeve mounted in the bush which contacts the yarn running through the bush.

23. An arrangement according to claim 22 wherein each sleeve is cylindrical with a wall thickness which increases from the ends of the sleeve to a maximum thickness at the axial mid-point of the sleeve.

24. A method of false twisting a running synthetic filament yarn comprising the steps of contacting the running yarn in succession with two moving deformable twist-imparting surfaces of different hardness to false twist the yarn, and arranging the yarn to apply a greater force to the harder of the two surfaces and a lesser force to the less hard of the two surfaces.

25. A false twisting arrangement for a running synthetic filament yarn comprising two deformable twist-imparting surfaces of different hardness positioned with the running yarn contacting the less hard surface with less force and the harder surface with greater force, and drive means for moving said surfaces to false twist the running yarn.

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