

PATENT SPECIFICATION

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(54) TRANSPORTING OF YARNS

(71) We, ZELLWEGER USTER LTD, a Swiss company, of CH 8610 Uster, Switzerland, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the transporting of yarns, especially filaments, through measuring units.

It is known that textile products, especially yarns, can be tested in regard to their cross-section over considerable lengths by means of measuring systems, for example with optical or capacitive means which probe the cross-section of the yarn, and reproduce the corresponding fluctuations in cross-section in the form of changes in the electrical signal released. Hitherto, yarns have been carried through the measuring zone by means of delivery rollers which, driven at a given rotational speed, move the yarn to be tested forward at a constant speed. This arrangement has proved to be entirely suitable for the transport of yarns made of natural fibres, for example of cotton or wool. However, in the case of filaments, the use of a delivery arrangement of this kind gives rise to the following difficulties; filaments of man-made fibres are extremely elastic and stretchable; they are wound under tension into relatively large packages, and are off wound by traction in the direction of the bobbin axis, so that the layers of filament lying firmly on top of one another have to be released from one another. This results in irregular traction and, hence, in variable elongation which is reflected in a variable cross-section of the filament. The basically high cross-sectional uniformity of the filaments calls for high sensitivity on the part of the measuring apparatus, so that the elongation-induced changes in cross-section appear to substantially the same extent as the actual

material-related changes in cross-section and, as a result, create a false impression increased, total irregularity. Although attempts have been made to eliminate or at least reduce tension-induced changes in elongation by using various types of filament brakes none of these attempts has been really successful.

Another disadvantage of arranging the delivery rollers after the measuring zone is that the material being tested leaving the delivery rollers tends to adhere to parts of the measuring apparatus. This is especially the case with highly electrostatic filaments. In their case, it is necessary to provide either winding units, which rewind the test material after it has left the delivery rollers, or an air-blast or evacuation unit which carries the tested material into a collecting vessel.

Another way of obtaining a signal actually corresponding to the material cross-section of filaments is to impart a so-called false-twist to the test material in the vicinity of the measuring zone in order to determine the cross-sectional form of the filament in the measuring zone. Both optical and capacitive measuring systems release different signals, depending on how the generally band-form material (in the case of filaments) is oriented in the measuring zone. If this orientation changes when the filament passes through the measuring zone, additional fluctuations in the measuring signal which are not caused by the cross-sectional form are superimposed upon the signal. Wrong indications of this kind are avoided by virtue of the false-twist in the filament which has to be applied by additional means.

An object of the present invention is to obviate these disadvantages. Accordingly, the invention provides a method of transporting a yarn, especially a filament, through a measuring unit, wherein the yarn is withdrawn from a supply package by means of delivery rollers and, after passing

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between the delivery rollers, passes through the measuring unit, the yarn issuing from the delivery rollers being carried along through the measuring unit by means of an airstream oriented substantially in the direction in which the yarn passes through the measuring unit, whereby the yarn is subjected to a uniform, adjustable tension as it passes through the measuring unit.

10 The invention also provides an apparatus for carrying out the method and comprising a pair of delivery rollers operable to withdraw a yarn from a supply package, a measuring unit through which the yarn can travel after leaving the delivery rollers, and a nozzle for producing an air stream oriented substantially in the direction in which yarn passes through the measuring unit thereby to produce a uniform adjustable tension in the yarn as it passes through the measuring unit.

20 In a practical embodiment of the method according to the invention, the airstream can be produced either by outflow from a pipe under excess pressure, or by the suction effect of a pipe under reduced pressure.

25 In one advantageous embodiment of the invention, the pipe is fitted with a regulating valve by which the rate of airflow and hence the tension applied to the yarn to be tested are made adjustable.

30 In one embodiment of an apparatus according to the invention the pipe for producing the airstream is introduced tangentially into the nozzle. As a result, the air in the nozzle forms a vortex and, in doing so, additionally imparts a twist to the yarn to be tested in the absence of any mechanical contact. The feedpipes can be introduced into the nozzle on opposite sides of the nozzle axis and connected by means of a three-way cock, so that a dextrorotatory or laevorotatory vortex is formed, according to requirements, and a false-twist directed to the left or right (S- or Z-twist) is additionally imparted to the yarn.

35 This is of particular advantage so far as ribbon-like filaments are concerned, because an average value of the cross-section is formed in this way in the measuring zone, thereby eliminating the so-called form effect of non-circular cross-sections of the kind in question.

40 One embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:

45 Figure 1 is a perspective view of a delivery arrangement,

Figure 2 is a section through a nozzle.

Figure 3 illustrates the airflows for a dextrorotatory vortex,

60 Figure 4 illustrates the airflows for a laevorotatory vortex in the nozzle.

Referring to Figure 1, a measuring unit 2, which can be in the form of, for example, a plate capacitor, measures the cross-section of a yarn 1 passed through it in known manner because of the influence which the yarn has on the capacitance. It is of course also possible to use other known measuring systems, for example optical measuring systems. The yarn 1 is wound off a supply package by means of motor-driven delivery rollers 3, 4. A yarn brake 10 can be arranged before the point at which the yarn enters the delivery rollers. The rotational speed or peripheral speed of the delivery rollers 3, 4 determines the rate at which the yarn passes through the measuring unit 2. The delivery rollers can be made to rotate at desired rotational speeds through gear systems (not shown) known *per se*. The rollers arrest any changes in the tension of the yarn and prevent them from entering the measuring zone.

70 In the absence of further measures, the yarn 1 issuing below the delivery rollers 3, 4 would be deposited onto the measuring unit without passing between the plates. Accordingly, another tensioning means has to be provided below the measuring unit 2 for imparting a predetermined tension to the yarn 1 in the measuring unit. This tensioning means is in the form of a small nozzle 7 which is operated in the manner of an injector with the airstream entering laterally and issuing downwards. The yarn 1 is entrained downwards by this airstream, so that it is subjected to a gentle, but sufficient and substantially constant, tension which provides for smooth passage through the measuring unit 2. This yarn tension is not sufficient to give rise to any appreciable elongation, with the result that no false cross-sectional values are presented to the measuring unit 2.

80 The strength of the airstream or the rate of flow of the issuing air and, hence, the level of tension acting on the yarn 1 can be adjusted by means of a controllable valve 13 fitted into the air pipe 11. The measured yarn 1 issuing from the nozzle 7 is collected for example in a collecting vessel 9.

85 Figure 2 is a section through a nozzle 7 which comprises a compartment 8 in which the air flowing in through the valve 13 and the pipe 11 is deflected and issues through the orifice 15.

90 For measuring filaments in capacitive or optical measuring units, the effect of the generally band-form cross-section has to be compensated in the measuring zone. This is achieved in known manner by imparting a so-called false-twist to the yarn, converting the ribbon form of the test material into a spiral form in the measuring zone. A mechanically driven twisting tube arranged in the immediate vicinity of the measuring

unit is used for producing the aforementioned false-twist in known arrangements.

5 The method and apparatus of this invention enable a false-twist to be produced without additional means. To this end, the point at which the airline opens into the compartment 8 of the nozzle 7 is tangentially arranged so that the inflowing air forms a vortex and, by entraining the yarn 1, twists it. Since this twist can be directed to the left or to the right (Z- or S-twist), two lines 11, 12 open tangentially into the nozzle 7, being combined in a three-way cock 14. 10 The air is steered through the left-hand line 11 or through the right-hand line 12, depending upon the position of the pivotal lever 16, and a correspondingly directed twist obtained. Figures 3 and 4 show these two variants. The strength of the airstream can be adjusted according to the selected opening of the cock. In another position of the three-way cock 14, air can be admitted simultaneously into both lines 11, 12, so that 20 no vortex is formed in the nozzle compartment 8 and, hence, no false-twist imparted to the yarn 1.

WHAT WE CLAIM IS:—

30 1. A method of transporting a yarn, especially a filament, through a measuring unit, wherein the yarn is withdrawn from a supply package by means of delivery rollers and, after passing between the delivery rollers, passes through the measuring unit, the yarn issuing from the delivery rollers being carried along through the measuring unit by means of an airstream oriented substantially in the direction in which the yarn passes through the measuring unit, whereby 40 the yarn is subjected to a uniform, adjustable tension as it passes through the measuring unit.

45 2. A method as claimed in claim 1, wherein the yarn travelling to the delivery rollers is stabilised by a yarn brake.

3. A method as claimed in either preceding claim, wherein the airstream entraining the yarn is produced in a nozzle acting in the manner of an injector.

50 4. A method as claimed in claim 3, wherein the airstream entraining the yarn is produced by the inflow of air under excess pressure.

55 5. A method as claimed in claim 3, wherein the airstream delivered to the nozzle is introduced tangentially into the nozzle compartment.

6. A method as claimed in claim 3, wherein the airstream is introduced tangentially into the nozzle compartment in direction such as to impart either a Z-twist or an S-twist. 60

7. A method of transporting a yarn through a measuring unit substantially as described with reference to the accompanying drawings. 65

8. An apparatus for carrying out the method claimed in claim 1, comprising a pair of delivery rollers operable to withdraw a yarn from a supply package, a measuring unit through which the yarn can travel after leaving the delivery rollers, and a nozzle for producing an air stream oriented substantially in the direction in which yarn passes through the measuring unit, thereby 70 to produce a uniform adjustable tension in the yarn as it passes through the measuring unit. 75

9. An apparatus as claimed in claim 8, comprising two airlines opening tangentially into the nozzle. 80

10. An apparatus as claimed in claim 9, wherein the airlines have an adjustable valve by which both the airflow and, hence, yarn tension can be controlled. 85

11. An apparatus as claimed in claim 9, wherein the airlines merge in an adjustable valve by which the airflow and, hence, yarn tension can be controlled. 90

12. An apparatus as claimed in claim 10, wherein the airlines open into the nozzle on opposite sides of the path of travel of the yarn therethrough and merge in a three-way cock, by which the flow of air through the line opening into the nozzle can be controlled in order to impart either an S- or Z-twist to the yarn. 95

13. An apparatus as claimed in claim 9, wherein the airlines merge in a three-way cock which can be turned into a neutral position, so that no air vortex is formed in the nozzle and, hence, no twist imparted to the yarn. 100

14. An apparatus as claimed in claim 8 for transporting yarn through a measuring device substantially as described with reference to the accompanying drawings. 105

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