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(54) **Rotary spiral element for introducing compensation and false twist into textile fibre slivers.**

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Description

This invention relates to a device providing compensation and false twist to a sliver and for depositing sliver in the form of cross-winding on a forming bobbin by means of a winding carriage in a gill box or derived machine. In the description given hereinafter and in the claims the term "sliver" will be used throughout to indicate a textile fibre roving, a textile fibre sliver or any other aggregate of textile fibres. In a gill box with sliver collection on bobbins of conventional type, the package is built up by winding the sliver on an idle roller, rotated by one or more fluted rollers, by means of a false twist device arranged to give the sliver roundness and strength and to allow individuality in subsequent unwinding.

It is well known that the sliver in being conveyed between the exit calender unit of the gill box and the winding system must be subjected to the necessary collection tension to form a compact bobbin. The winding must therefore be effected with the sliver fibres as condensed as possible so that the cohesion between the fibres does not allow false draft to arise in that part of the sliver between its exit from the gill box and its deposition on the surface of the forming bobbin. The sliver leaving the calender unit is often fragile, as its constituent fibres are short or held together with little twist. The sliver is also subjected to a cyclic variation in distance between the fixed point of exit from the calender unit of the gill box and the mobile winding yarn guide driven with a to-and-fro movement along the forming bobbin. This variation in the collection distance must not result in a sliver tension which changes the dimensional and quality characteristics of the sliver between the calender exit and the point in which the winding operation occurs. Relatively large tension variations could also lead to sliver breakage. It is also clear that a breakage of this kind interrupts the production process and requires the assistance of service personnel.

The labour cost of such emergency assistance is a considerable factor in calculating the production costs. Various solutions have already been proposed to overcome this winding problem. In US-A-3,670,978 it is proposed for example to pass the sliver through an intermediate guide ring mounted between the exit of the gill box calender unit and the winding system in a manner mobile such that the sum of the distance between the ring and the calender exit and the distance between the ring and the sliver guide is always constant. Different systems based on the same principle have also been proposed and constructed, comprising for example toggle joint levers or similar elements able to form the desired linkage. However, these solu-

tions all have drawbacks in that they involve the reciprocating movement of relatively large masses, and cannot be applied to current high-speed machines, not only because of the large amount of energy involved and the rapid wear of the various members, but also because vibration and consequent fatigue failures can occur. Many attempts have been made by the applicant to ensure a sliver bobbin winding which is as uniform as possible. A typical example of these practical attempts by the applicant is described in EP-A-0 295 731 (which represents a prior art document according to Article 54(3) EPC). The device described in this document comprises at least a twisting spiral element, and an active-twisting element constituted by a revolving funnel, with the first element being positioned upstream the second one, with both elements cooperating in order to wind the compact, rounded sliver on the collecting bobbin and to keep the sliver always subject to an elastic compensation for the periodic changes in length of the distance between the intermediate winding points and the end winding points of the bobbin under formation. This device works well compared with devices previously proposed in the art, however its operation could be improved. In this respect, the application of said previously proposed device has been found not perfectly satisfactory in that when certain types of sliver are used it results in non-uniform twisting because of the intricate guiding of the sliver along the fixed turns of the spiral element provided in said device. This effect, even if very limited, is undesirable because it ruins the appearance of the sliver and in addition can initiate false draft which influences the strength of the collected sliver during its unwinding in the next processing stage.

In the light of this and of the aforesaid defects and drawbacks, the object of the present invention is to provide an improved device of the last mentioned type which is able to guide the sliver on the surface of the forming bobbin, while simultaneously compensating said distance variation by the insertion of a large number of twists which make the sliver resistant and elastic during the entire cross-winding so that the spiral element of the device does not suffer from the aforesaid drawbacks. To this end, according to the invention, a device is proposed having the features as defined in claim 1. Further preferred features of the device are defined in the subclaims.

The spiral element of the device consists of a tube or wire of spring steel or other wear-resistant material wound helically with its pitch and number of turns dependent on the type and weight of the material to be worked. As the spiral element is simply a steel wire or tube, it has minimum inertia and therefore does not substantially affect the rapid

movement reversals of the winding carriage. The rotary spiral element inserts a large number of twists deriving partly from the twisting action of its helix turns and partly from its rotation about itself. This provides the necessary binding and compactness to the sliver fibres to ensure that the sliver acts elastically when under tension during the cross-winding operation. More specifically, the rotary spiral guides the sliver up to its collection on the surface of the forming bobbin, while simultaneously giving the sliver a twist extending in direction back to the calender unit. Said twist, which extends along the portion upstream of the spiral element as far as the exit from the calender unit, is more concentrated along those sliver portions of lesser cross-section, so making up for their lesser strength than the other portions of greater cross-section. As is apparent, this makes the strength uniform along the entire sliver and eliminates portions of low torsional strength which can easily undergo breakage to result in interruption to the production process, with some of the aforesaid consequences.

The twist inserted into the sliver at its exit from the calender unit by means of the rotary spiral element therefore advantageously keeps the component fibres of the sliver bound together and enables it to be tensioned by elastic elongation to provide perfect compensation for the distance variation without the danger of creating false draft.

Because of the simplicity and lightness of the rotary spiral element, the machine collection rate can be substantially increased and the machine cost considerably reduced. The rotation of the spiral element about itself contributes to substantial improvement in the twist of the collected sliver and results in its perfect roundness. In this respect, it has been found that rotating the spiral yarn guide element about its axis results in twist which is propagated in a uniformly distributed manner to consequently provide consistency to the cross-section of the fibre sliver under continuous winding, so eliminating so-called "marrying", ie the adhesion together of flat fibres to create imperfections during the next production process stage involving the unwinding of the bobbin.

A preferred embodiment of the device of the present invention is described hereinafter by way of non-limiting example with reference to the single accompanying drawing. On the drawing: 2 is a dashed line schematically indicating the gill box or derived machine; 1 is the calender unit operating as a feed means for the sliver leaving the gill box 2; 7 is the presser roll of the calender unit 1, which together with the roll 8 continuously extracts the fibre sliver 9 from the drafting zone; 9 is the textile fibre sliver consisting substantially of a more or less numerous aggregate of textile fibres of varying

length; 3 is a rotary spiral element in the form of a helical spring with one or more helixes, having an inner diameter which is positive, or in the limit negative, and with a turn pitch depending on the type of fibre and the weight of the sliver to be worked. Said spiral element 3 has two ends, one of which is joined to the rotary bush 6 and the other is fixed to the condensing bush 14; 19 is the plate for connecting and supporting the device of the present invention to and on the reciprocating winding carriage 20 which is guided to move parallel to the axis of the forming bobbin 16; 24 is the bush slidable along the cylindrical guide bar 22 positioned parallel to the axis 30 of the drive roller 32 for the forming bobbin 16; 26 is the profiled support plate for the entire device, and driven with reciprocating motion along a transverse travel path substantially equal to the desired axial length of the bobbin 16; 4 is the bearing assembly allowing the bush element 6 to rotate about itself while caused by the reciprocating carriage 20 to continuously move to-and-fro; 5 is the non-rotating outer casing of the element 6; 18 is the suitably shaped grooved pulley which by the action of a round belt 12 or similar element and with the cooperation of the backing surface or guide 15 generates the rotary movement of the element 6 by deriving it from said reciprocating movement; 14 is the condensing bush with an inner surface of spherical, conical or frusto-conical profile converging in the direction along which the sliver 9 is collected on the bobbin 16.

The operating description given hereinafter with reference to the said figure relates in particular to the device of the invention, whereas those elements or devices which are cooperative or complementary during operation are not described, as these are of the known art. The sliver, roving or fibre aggregate leaving the calender unit 1 is inserted into the spiral 3 along its axis and is conveyed through the condensing bush 14 to be collected on the periphery of the bobbin 16 rotating on the winding spindle 28. The twist inserted both by the rotation of the rotary spiral element 3 and by the friction along the inner surface of its helix turns travels back rapidly and continuously as far as the rolls 7 and 8 to give the sliver that torsional compactness necessary to make it elastic under the alternate tensioning present in a cross-winding. A preferred embodiment of the invention has been described herein, however the shape and dimensions of the parts can be changed, or the wire of the spiral element can be other than circular in shape, such as oval, rectangular or the like, without leaving the scope of the present invention as claimed hereinafter.

Claims

1. A device for providing compensation and false twist to a sliver (9) leaving the calender unit (1) of a gill box (2) and for depositing the sliver (9) in the form of cross-winding on a forming bobbin (16) by means of a winding carriage (19,20) moved transversally to-and-fro parallel to the axis (30) of the drive roller (32) for said forming bobbin (16), said device comprising a casing (5) connected to and supported on said winding carriage (19,20), a bush (6) rotatably supported in said casing (5) by means of a bearing assembly (4), means (12,15) for rotating said bush (6) and a spiral element (3) having two ends, one of which being joined to said bush (6) and the other being fixed to a condensing bush (14), said sliver (9) being guided and conveyed through said spiral element (3) and said condensing bush (14) on the surface of the forming bobbin (16), while simultaneously a twist extending in direction back to said calender unit (1) is given to the sliver (9). 5 10 15 20
2. A device as claimed in claim 1, characterised in that said spiral element (3) rotates in one direction and then in the other as a consequence of its linkage to the alternating direction of motion involved in the said transverse to-and-fro movement of said winding carriage (19,20). 25 30
3. A device as claimed in claim 1, characterised in that said spiral element (3) rotates in a single direction independently of the alternating direction of motion involved in the said transverse to-and-fro movement of said winding carriage (19,20). 35
4. A device as claimed in claim 1 and one or other of the subsequent claims, characterised in that the helical turns of said spiral element (3) are constructed of tube or low weight so as to provide minimum inertia to the alternating motion and the associated rotary movement under high collecting speeds. 40 45

Patentansprüche

1. Vorrichtung zur Erzeugung eines Spannungsausgleichs und einer Falschdrehung in einem die Kalandereinheit (1) einer Gillbox (2) verlassenden Spinnband (9) und zur Ablage des Spinnbands (9) in Form einer Kreuzwicklung auf einer sich aufbauenden Spule (16) mittels eines Bewicklungsschlittens (19, 20), der in Querrichtung parallel zur Achse (30) der Antriebsrolle (32) für die sich aufbauende Spule 50 55

(16) hin und her bewegt wird, wobei die Vorrichtung ein mit dem Bewicklungsschlitten (19, 20) verbundenes und auf ihm abgestütztes Gehäuse (5), eine mittels einer Lageranordnung (4) drehbar in dem Gehäuse (5) abgestützte Buchse (6), Mittel (12, 15) zum Drehen der Buchse (6), und ein Spiralelement (3) mit zwei Enden aufweist, von denen eines mit der Buchse (6) verbunden und das andere an einer Verdichtungsbuchse (14) befestigt ist, wobei das Spinnband (9) durch das Spiralelement (3) und die Verdichtungsbuchse (14) auf die Oberfläche der sich aufbauenden Spule (16) geleitet wird, während dem Spinnband (9) gleichzeitig eine sich rückwärts zur Kalandereinheit (1) erstreckende Verdrillung mitgegeben wird.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Spiralelement (3) sich als Folge seiner Kopplung an die wechselnde Bewegungsrichtung, die sich aus der Hin- und Herbewegung des Bewicklungsschlittens (19, 20) in Querrichtung ergibt, in eine Richtung und darauf in die andere dreht.
3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Spiralelement (3) sich unabhängig von der wechselnden Bewegungsrichtung, die sich aus der Hin- und Herbewegung des Bewicklungsschlittens (19, 20) in Querrichtung ergibt, in einer einzigen Richtung dreht.
4. Vorrichtung nach Anspruch 1 und einem der folgenden Ansprüche, dadurch gekennzeichnet, daß die schraubenförmigen Windungen des Spiralelements (3) als Rohr oder mit geringem Gewicht ausgeführt sind, um der wechselnden Bewegung und der zugeordneten Drehbewegung bei hohen Sammelgeschwindigkeiten niedrigste Trägheitskräfte entgegenzusetzen.

Revendications

1. Dispositif pour appliquer une compensation et une fausse torsion à une mèche (9) de fibres quittant le dispositif de calandrage (1) d'un gill box (2) et pour déposer la mèche (9) de fibres sous la forme d'un enroulement croisé sur une bobine de renvidage (16) au moyen d'un chariot d'enroulement (19, 20) déplacé transversalement en va-et-vient parallèlement à l'axe (30) du rouleau d'entraînement (32) adjoint à ladite bobine de renvidage (16), le dispositif sus-visé comprenant un boîtier (5) fixé au chariot d'enroulement (19, 20) et supporté par ce chariot, une douille (6) supportée de façon tournante dans le boîtier (5) au moyen d'un

agencement de palier (4), des moyens (12, 15) pour faire tourner la douille (6) et un élément hélicoïdal (3) comportant deux extrémités dont l'une est fixée à la douille (6) et dont l'autre est fixée à un condenseur (14), la mèche (9) de fibres étant guidée et acheminée à travers l'élément hélicoïdal (3) et le condenseur (14) sur la surface de la bobine de renvidage (16) tandis qu'une torsion en direction de l'arrière vers le dispositif de calandrage (1) est communiquée simultanément à la mèche (9).

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2. Dispositif selon la revendication 1, **caractérisé** en ce que l'élément hélicoïdal (3) tourne dans un sens puis dans l'autre par suite de son couplage avec le sens de mouvement alternatif ayant lieu au cours du déplacement de va-et-vient transversal du chariot d'enroulement (19, 20).

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3. Dispositif selon la revendication 1, **caractérisé** en ce que l'élément hélicoïdal (3) tourne dans un seul sens indépendamment du sens du mouvement alternatif ayant lieu lors du déplacement transversal de va-et-vient du chariot d'enroulement (19, 20).

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4. Dispositif selon la revendication 1 et l'une ou l'autre des revendications suivantes, **caractérisé** en ce que les spires de l'hélice de l'élément hélicoïdal (3) sont formées par un élément tubulaire ou un élément de faible poids de manière à assurer une inertie minimale au mouvement alternatif et au déplacement de rotation associé en présence de vitesses de réception élevées.

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