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EUROPEAN PATENT APPLICATION

②① Application number: **88202830.1**

⑤① Int. Cl.⁴: **B65H 59/00 , D01H 13/04**

②② Date of filing: **09.12.88**

③③ Priority: **18.12.87 IT 2308987**

④③ Date of publication of application:
21.06.89 Bulletin 89/25

⑥④ Designated Contracting States:
BE CH DE ES FR GB GR LI

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

⑤⑦ The invention relates to a spiral yarn guide element (3) for providing compensation and false twist to a sliver (9) leaving a gill box (2) and for depositing it in the form of cross-winding on a forming bobbin (16), said spiral element (3) rotating rapidly about itself while being moved transversely to-and-fro parallel to the axis of the drive roller along a reciprocating path of travel equal substantially to the axial length of said bobbin (16) being wound.

EP 0 321 034 A1

ROTARY SPIRAL ELEMENT FOR INTRODUCING COMPENSATION AND FALSE TWIST INTO TEXTILE FIBRE SLIVERS

This invention relates to a rotary spiral element which operates as a yarn guide and as a compensator and twister element in depositing sliver cross-windings 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 a 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 to 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 calendar 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 labor 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 patent 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 solutions 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 present applicant to ensure a sliver bobbin winding which is as uniform as possible. A typical example of these practical attempts by the present applicant is described in Italian patent application No. 88200983.0. The spiral element described in said application works well compared with devices already proposed in the art, however its operation could be improved. In this respect, its application has not been found 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. 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 of the arrangements of the current art, the object of the present invention is to provide a rotary spiral twister element for the winding carriage of a gill box which is able to guide the sliver while simultaneously compensating said distance variation by the insertion of a large number of twists which make it resistant and elastic during the entire cross-winding so that said rotary spiral element does not suffer from aforesaid drawbacks of known devices. To this end, according to the invention the applicant has designed, experimented with and perfected a rotary spiral element for inserting twist and compensation into textile fibre slivers, consisting 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 rotary 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 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 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 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 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, the machine collection rate can be substantially increased and the machine cost considerably reduced. The rotation of the helix about itself contributes to substantial improvement in the twist of the collected sliver and results in its perfect roundness. In this respect, after much experimental work the applicant has 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. These and further advantages are all attained by the improved tensioning element for a winding carriage, according to the present invention, comprising a yarn guide spiral which rotates rapidly about its axis while being moved transversely to-and-fro parallel to the axis of the drive roller. Said spiral yarn guide 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.

According to one embodiment, the spiral yarn guide comprises a spiral rotating in a single direction independently of the alternating direction of motion involved in the said transverse to-and-fro movement. According to a further embodiment, the spiral yarn guide element comprises helical turns constructed of tube of low weight so as to provide minimum inertia to the alternating motion and the

association rotary movement, this being particularly useful for high collecting speeds.

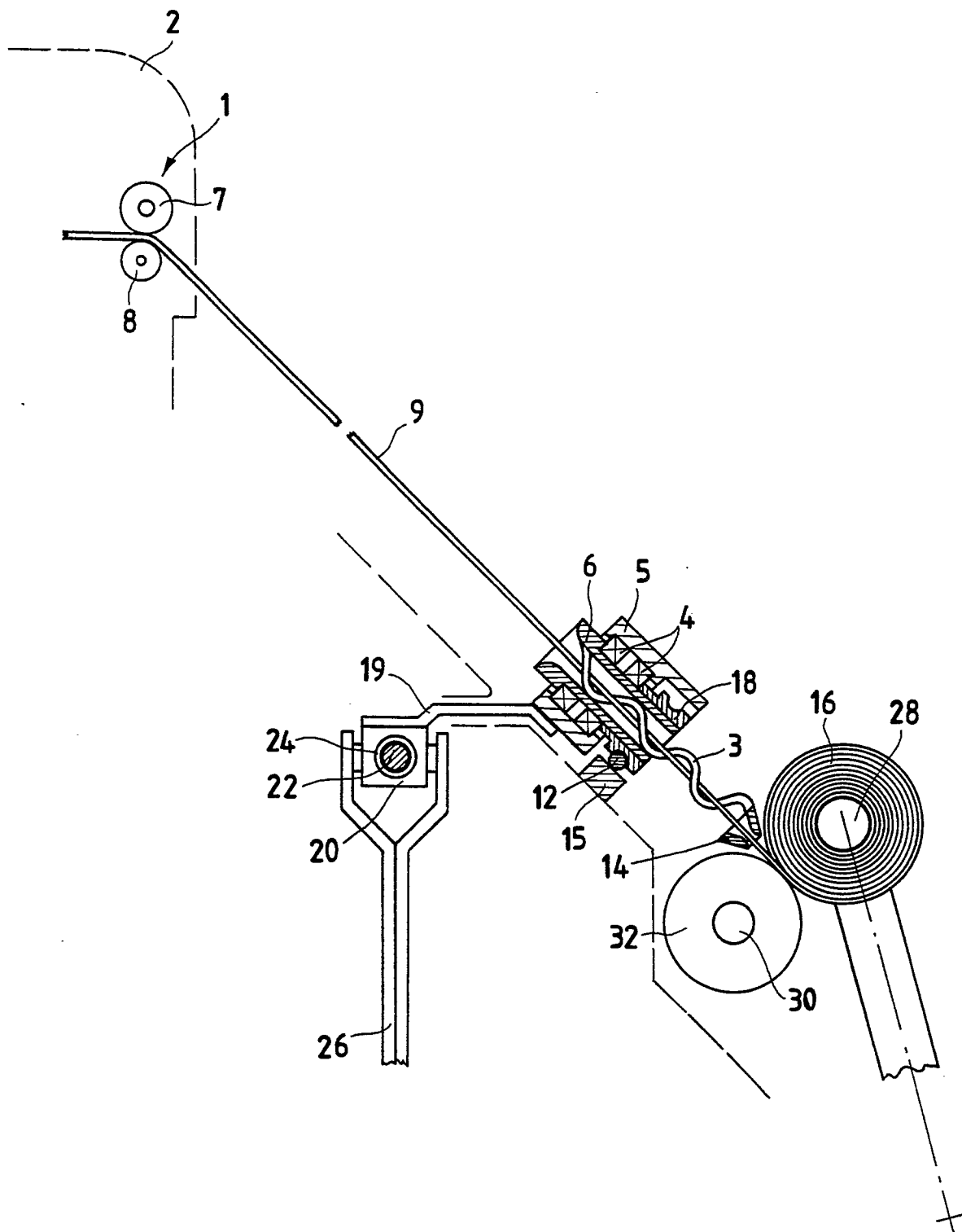
A preferred embodiment of the spiral yarn guide element is described hereinafter by way of non-limiting example with reference to the single accompanying drawing. The accompanying drawing shows a diagrammatic side view of a rotary spiral yarn guide element for inserting twist and providing elastic compensation, according to the invention, and also showing upstream the calender unit through which the sliver leaves the gill box, and downstream the cross-winding system for forming the sliver collection bobbin. 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 in the form of a helical spring with one or more helices, having an inner diameter which is positive, or in the limit negative, and with a turn pitch depending on the type of the fibre and the weight of the sliver to be worked. Said spiral 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 movement mechanism 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 movement mechanism 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 that which is new and ignores those elements or devices which are cooperative or complementary during operation, as these are of the known art.

The sliver, roving or fiber 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 3 and by the friction along the inner surface of the 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 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 spiral yarn guide element for providing compensation and false twist to a sliver leaving a gill box and for depositing it in the form of cross-winding on a forming bobbin by means of a winding carriage, characterised in that it rotates rapidly about itself while being moved transversely to-and-fro parallel to the axis of the drive roller.
2. A spiral yarn guide element as claimed in claim 1, characterised in that it 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.
3. A spiral yarn guide element as claimed in claim 1, characterised in that it rotates in a single direction independently of the alternating direction of motion involved in the said transverse to-and-fro movement.
4. A spiral yarn guide element as claimed in claim 1 and one or other of the subsequent claims, characterised in that the helical turns are constructed of tube of low weight so as to provide minimum inertia to the alternating motion and the associated rotary movement under high collecting speeds.





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 88 20 2830

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	EP-A-0070814 (SAVIO) * page 6, line 32 - page 7, line 20; figures 3-6 *	1	B65H59/00 D01H13/04
A	GB-A-2104923 (SANT' ANDREA NOVARA OFFICINE MECCANICHE E FONDERIE) ---		
A,D	US-A-3670978 (DRAGISICH) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B65H D01H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 APRIL 1989	Examiner RAYBOULD B.D.J.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document			