

PATENT SPECIFICATION

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(54) APPARATUS FOR WINDING A THREAD DELIVERED AT A CONSTANT SPEED

(71) We, SCHUBERT & SALZER MASCHINENFABRIK AKTIEN-GESELLSCHAFT., of Freidrich-Ebert-Strasse, 84, 8070 Ingolstadt, Germany, 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:—

10 This invention relates to an apparatus for winding a thread, delivered from a source at a constant speed, onto a bobbin, via an arcuate thread guide member bent outwardly towards the thread and arranged between the source and the bobbin.

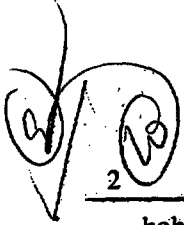
15 It is conventional practice to wind a thread — which has been delivered at a constant speed from a textile machine, for example an open-end spinning machine — to the form of a cylindrical or conical cross-wound package, directly after this thread has been formed in the textile machine. The bobbin, or the package being formed on the latter, is in frictional contact with a driven shaft, and is rotated by the latter, while a reciprocating movement, extending the whole width of the bobbin, is imparted to the thread. Owing to the reciprocatory movement the length of the path of thread travel — this path extending from the thread delivery point to the point at which the thread is wound — alters, as a result of which different thread tensions arise for a constant speed of thread delivery.

30 It has already been proposed, for compensating for the fluctuations in thread tension — these fluctuations being caused by the changing length of the path of thread travel — to guide the thread by way of an arcuate, rigid thread guide member located between the point of thread delivery and the reciprocatory mechanism, this arcuate thread guide member having an outwardly-bent profile (U.S.A. Patent Specification 3,690,576). It is possible in this way to compensate for the length of the path of thread travel and also for the fluctuations in thread tension caused

by the different path lengths. However, the thread tension depends not only on the length of the path of thread travel, but also on dynamic thread stresses during the winding process and on the frictional conditions at the arcuate thread guide member.

As the winding speed of the thread is the resultant of the circumferential speed of the winding shaft and of the speed of reciprocatory movement, although the speed of reciprocatory movement is reduced practically to zero at the reversal point, there is always a short-term alteration, at the reversal point, of the winding speed and, hence, dynamic thread tension alterations with high amplitude. Also, high acceleration forces act on the thread, at the reversal point, by reasons of the alteration of direction. These high acceleration forces also result in alterations in the thread tension, these alterations leading to disturbances in the process whereby the thread is wound on to the edges of the bobbin. The known, rigid arcuate thread guide member is unable to compensate for either dynamic thread tensions of this kind or for the alterations in thread tension which occur during the winding of conical bobbins, these thread tension alterations being attributable to the fact that at the start of the winding process the percentage alteration of the winding speed from small to large diameter is at its greatest and decreases with the increasing size of package.

Finally, problems occur — particularly in winding a thread delivered at constant speed from an open-end rotor spinning machine — due to the fact that thread is subject, during draw-off from the rotor, to a mean thread tension, which stretches the thread to a specific degree and can then relax the thread in the winding zone. According to the type of fibre, yarn count, and yarn twist in each instance, different relaxation forces are set up; these relaxation forces may also fluctuate during the spinning — and winding-processes within a



bobbin. This means that a thread which is guided over the known arcuate thread guide member is wound with different thread tension (pre-stretch); this may lead to colour differences in the yarn when dyeing is subsequently performed.

Underlying the present invention is the object of providing an apparatus of the type defined at the outset, which enables any type of alterations in thread tension and thread tension peaks to be compensated for during the winding of the thread.

According to the present invention the arcuate thread guide member is mounted on its holder in such a way that it can resiliently yield transversely of the direction of travel of the thread. In an embodiment of the invention which is favourable in respect of costs and which ensures good stability of the arcuate thread guide member in the direction of thread travel, the resilient mounting elements consist of leaf springs, constituted as double springs. A soft response of the leaf springs is achieved by attaching the ends of the leaf springs to one another with the interposition of resilient elements. In another embodiment, the resilient mounting is effected by compression springs, or this resilient mounting is achieved by arranging for a carrier bar, which receives the arcuate thread guide member, to consist of a resilient material which is connected by a web to a holding bar, which serves as holding means. In the case of the latter-mentioned embodiment the carrier bar, the web, and the holding bar are, conveniently, manufactured in the form of a single unit. The production of conical, cross-wound packages is rendered possible by arranging the web eccentrically of the arcuate thread guide member.

Embodiments of the invention are described below with reference to Figures 1 to 5 of the drawing, in which:

Figure 1 is a perspective view of parts of a thread-winding apparatus, with an arcuate thread guide member;

Figures 2 to 5 illustrate, in plan view, embodiments of the arcuate thread guide member according to the invention.

As shown in Figure 1, a thread F — which, in the case under consideration, is delivered from an open-end rotor spinning machine (not shown), at constant speed, and is continuously drawn off by a pair of draw-off rollers 1, 10 — is wound, by means of a reciprocating thread guide 2, onto a bobbin 30, clamped in a bobbin holder 3, for forming a cylindrical or conical cross-wound package. The bobbin 30 rests on a driven bobbin roller 4, and rotates through frictional contact.

An arcuate thread guide member 6 is fixed, between the thread draw-off rollers 1, 10 and the thread guide 2, on a longitudinal

component 5 of the machine, this component 5 being constituted in this example as the suction duct. Thread F runs over the arcuate thread guide member 6. The arcuate thread guide member 6 is bent outwardly in the direction of the thread F, and its profile is determined by the changing length of the thread path between the thread draw-off rollers 1, 10 and the thread winding station, the length of the thread path altering by reason of the reciprocating movements of the thread F. The arcuate thread guide member 6 is thus enabled to compensate for the alterations in the thread length occurring during the process whereby the thread is wound up — these alterations being conditioned by the triangle (dashed line) described by the changing path of thread travel — and for the alterations in thread tension associated with these alterations in thread length.

According to the present invention it is proposed to modify this known assembly by arranging for the arcuate thread guide member 6 to be secured to its holder in such a way that it can yield resiliently transversely of the direction of travel of the thread F. The longitudinal component 5 may itself constitute the holder or, more conveniently, a holding bar 61 (Figures 2 to 5) may form the holder, in which case this bar 61 is fixed in some suitable way to the longitudinal component 5.

Alterations in thread tension caused by dynamic thread stresses occurring during the winding up of the thread are effectively compensated for by the resilient mounting, to be described in detail below, of the arcuate thread guide member 6. In particular, peaks in thread tension — these peaks occurring at the points of reversal in travel of the thread guide 2, and causing the thread to unwind from the bobbin — are compensated for by virtue of the fact that the arcuate thread guide member 6 resiliently yields to the stronger pressure, acting on it, of the thread F. When pattern-preventing drives are used — these drives serving to prevent pattern windings on the bobbin by imparting a high reversal acceleration to the reciprocating thread guide 2 in the edge areas of the bobbin — the resilient arrangement of the arcuate thread guide member 6 effects a longitudinal compensation, the thread tension remaining constant. The resiliently mounted arcuate thread guide member 6 also enables conical packages to be satisfactorily wound, the formation of these packages entailing, when the speed of thread delivery is constant, particular difficulties because different lengths of thread F are wound on the bobbin at each side of the latter.

The resilient mounting of the arcuate thread guide member 6 may be realised in

various ways. Figure 2 illustrates an embodiment in which the arcuate thread guide member 6, arranged on a carrier bar 62, is mounted — by means of two two-armed leaf springs 71 and 72, which are constituted as double springs and each of which is centrally fixed on the carrier bar 62 and on the holding bar 61 — for resilient yielding movement transversely of the direction of travel of the thread F. The arms of the leaf springs 71 and 72, which move away from the carrier bar 62 and from the holding bar 61 respectively, form, in this form of construction, the arms of a triangle, and are interconnected, at their ends, by screws 73 or the like. Conveniently, and for the purpose of ensuring a soft response of the resilient, yielding system, the free ends of the leaf springs 71, 72 may be attached together with the interposition of suitable resilient elements 74, for example rubber discs.

Naturally, the two two-armed leaf springs 71, 72 may be replaced by four single-arm leaf springs, so as to achieve the illustrated arrangement of a double spring.

Figure 3 shows the double springing system of the arcuate thread guide member 6, in which four one-armed leaf springs 75, 76, 77 and 78 are used. The pairs 75, 76 and 77, 78 are each attached to the ends of the holding bar 61 and the carrier bar 62, and extend inwardly away from the bars, so that the points of connection of each pair of leaf springs lie opposite one another. The attachment between leaf spring 75 and 76 and between leaf spring 77 and 78 is also effected, conveniently, in this embodiment by means of screws 73, preferably with the interposition of resilient elements 74, as illustrated in Figure 2.

The use of leaf springs, as illustrated in Figures 2 and 3, as resilient mounting elements for the arcuate thread guide member 6 is structurally simple and cheap, and also has a number of further advantages. The centre point of the arcuate thread guide member 6 remains in its central position for all positions of yielding of the resilient system; thus, the arcuate thread guide member is always guided. Also, the resilient yielding system responds rapidly, and this is of particular importance in the case of high speeds of thread travel. Also, the stability of the apparatus is ensured in the direction of thread travel. This stability may, if necessary, be further increased by the use of wider or harder leaf springs; however, a soft response of the resilient spring system is achieved by the use of resilient elements 74 at the interconnection points of the ends of the leaf springs.

In the embodiment illustrated in Figure 4, the mounting of the arcuate thread guide

member 6 for resilient yielding transversely of the direction of thread travel is accomplished by the use of compression springs 80 and 81, which are fixed to the holding bar 61 and to the carrier bar 62 near the ends of the latter.

A further way of mounting the arcuate thread guide member 6, in such a way that it will resiliently yield transversely of the direction of travel of the thread F, consists in making the carrier bar 62 of a resilient material, and attaching it to the holding bar 61 by means of a web 63, which is disposed centrally of the arcuate thread guide member 6 (Figure 5). The web 63 may be made with a separate part, and attached to the two bars. However, it is preferable to manufacture the carrier bar 61, the holding bar 62, and the web 63 as a single, integral unit. For the manufacture of conical, cross-wound packages, there is provided, instead of the web 63 positioned centrally of the arcuate thread guide member 6, a web 63', which is positioned eccentrically of the arcuate thread guide member 6.

The mounting of the arcuate thread guide member 6 for resilient yielding transversely of the direction of travel of the thread F may be realised in ways different from that described above. For example, the arcuate thread guide member 6 may be suspended on at least one helical spring, which extends in the direction of travel of the thread F, or a pneumatic cushioning system may be used for the arcuate thread guide member 6.

In the embodiments of the invention illustrated, the arcuate thread guide member lies parallel to the axis of the bobbin. However, the above-described manner in which the thread tension is compensated for does not depend on the parallel relationship between the arcuate thread guide member and the axis of the bobbin; in principle this compensation can be realised with the arcuate thread guide member in non-parallel relationship to the axis of the bobbin. What is essential is that the pressure created by the thread bearing against the arcuate thread guide member should be resiliently absorbed.

The invention is illustrated by means of embodiments using a reciprocating thread guide.

However, the invention may be implemented with particular advantage using a thread-winding apparatus, in which the thread is laid on the bobbin by means of a slotted drum, a grooved cylinder, or a butterfly guide.

WHAT WE CLAIM IS:—

1. Apparatus for winding a thread, delivered from a source at constant speed, onto a bobbin, via an arcuate thread guide member bent outwardly towards the thread



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various ways. Figure 2 illustrates an embodiment in which the arcuate thread guide member 6, arranged on a carrier bar 62, is mounted — by means of two two-armed leaf springs 71 and 72, which are constituted as double springs and each of which is centrally fixed on the carrier bar 62 and on the holding bar 61 — for resilient yielding movement transversely of the direction of travel of the thread F. The arms of the leaf springs 71 and 72, which move away from the carrier bar 62 and from the holding bar 61 respectively, form, in this form of construction, the arms of a triangle, and are interconnected, at their ends, by screws 73 or the like. Conveniently, and for the purpose of ensuring a soft response of the resilient yielding system, the free ends of the leaf springs 71, 72 may be attached together with the interposition of suitable resilient elements 74, for example rubber discs.

Naturally, the two two-armed leaf springs 71, 72 may be replaced by four single-arm leaf springs, so as to achieve the illustrated arrangement of a double spring.

Figure 3 shows the double springing system of the arcuate thread guide member 6, in which four one-armed leaf springs 75, 76, 77 and 78 are used. The pairs 75, 76 and 77, 78 are each attached to the ends of the holding bar 61 and the carrier bar 62, and extend inwardly away from the bars, so that the points of connection of each pair of leaf springs lie opposite one another. The attachment between leaf spring 75 and 76 and between leaf spring 77 and 78 is also effected, conveniently, in this embodiment by means of screws 73, preferably with the interposition of resilient elements 74, as illustrated in Figure 2.

The use of leaf springs, as illustrated in Figures 2 and 3, as resilient mounting elements for the arcuate thread guide member 6 is structurally simple and cheap, and also has a number of further advantages. The centre point of the arcuate thread guide member 6 remains in its central position for all positions of yielding of the resilient system; thus, the arcuate thread guide member is always guided. Also, the resilient yielding system responds rapidly, and this is of particular importance in the case of high speeds of thread travel. Also, the stability of the apparatus is ensured in the direction of thread travel. This stability may, if necessary, be further increased by the use of wider or harder leaf springs; however, a soft response of the resilient spring system is achieved by the use of resilient elements 74 at the interconnection points of the ends of the leaf springs.

In the embodiment illustrated in Figure 4, the mounting of the arcuate thread guide

member 6 for resilient yielding transversely of the direction of thread travel is accomplished by the use of compression springs 80 and 81, which are fixed to the holding bar 61 and to the carrier bar 62 near the ends of the latter.

A further way of mounting the arcuate thread guide member 6, in such a way that it will resiliently yield transversely of the direction of travel of the thread F, consists in making the carrier bar 62 of a resilient material and attaching it to the holding bar 61 by means of a web 63, which is disposed centrally of the arcuate thread guide member 6 (Figure 5). The web 63 may be made with a separate part, and attached to the two bars. However, it is preferable to manufacture the carrier bar 61, the holding bar 62, and the web 63 as a single, integral unit. For the manufacture of conical, cross-wound packages, there is provided, instead of the web 63 positioned centrally of the arcuate thread guide member 6, a web 63', which is positioned eccentrically of the arcuate thread guide member 6.

The mounting of the arcuate thread guide member 6 for resilient yielding transversely of the direction of travel of the thread F may be realised in ways different from that described above. For example, the arcuate thread guide member 6 may be suspended on at least one helical spring, which extends in the direction of travel of the thread F, or a pneumatic cushioning system may be used for the arcuate thread guide member 6.

In the embodiments of the invention illustrated, the arcuate thread guide member lies parallel to the axis of the bobbin. However, the above-described manner in which the thread tension is compensated for does not depend on the parallel relationship between the arcuate thread guide member and the axis of the bobbin; in principle this compensation can be realised with the arcuate thread guide member in non-parallel relationship to the axis of the bobbin. What is essential is that the pressure created by the thread bearing against the arcuate thread guide member should be resiliently absorbed.

The invention is illustrated by means of embodiments using a reciprocating thread guide.

However, the invention may be implemented with particular advantage using a thread-winding apparatus, in which the thread is laid on the bobbin by means of a slotted drum, a grooved cylinder, or a butterfly guide.

WHAT WE CLAIM IS:—

1. Apparatus for winding a thread, delivered from a source at constant speed, onto a bobbin, via an arcuate thread guide member bent outwardly towards the thread

and arranged between the source and the bobbin, characterised in that the arcuate thread guide member is mounted on its holder in such a way that it can yield resiliently transversely of the direction of travel of the thread.

2. Apparatus according to Claim 1, characterised in that the resilient mounting elements consist of leaf springs, which are constituted as double springs.

3. Apparatus according to Claim 2, characterised in that the ends of the leaf springs are attached to one another with the interposition of resilient elements.

4. Apparatus according to Claim 1, characterised in that the resilient mounting is effected by compression springs.

5. Apparatus according to Claim 1, characterised in that a carrier bar, which receives the arcuate guide member, consists of a resilient material, and is connected to a

holding bar by a web, the holding bar serving as a holding means.

6. Apparatus according to Claim 5, characterised in that the carrier bar, the web, and the holding bar, are manufactured as an integral unit.

7. Apparatus according to Claims 5 and 6, characterised in that the web lies eccentrically of the arcuate thread guide member.

8. Apparatus for winding a thread, delivered at constant speed, onto a bobbin, substantially as hereinbefore described with reference to, and as shown in, any of Figures 2 to 5 of the accompanying drawings.

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