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PROCESS FOR THE FORMATION OF DENSE WINDING BODIES

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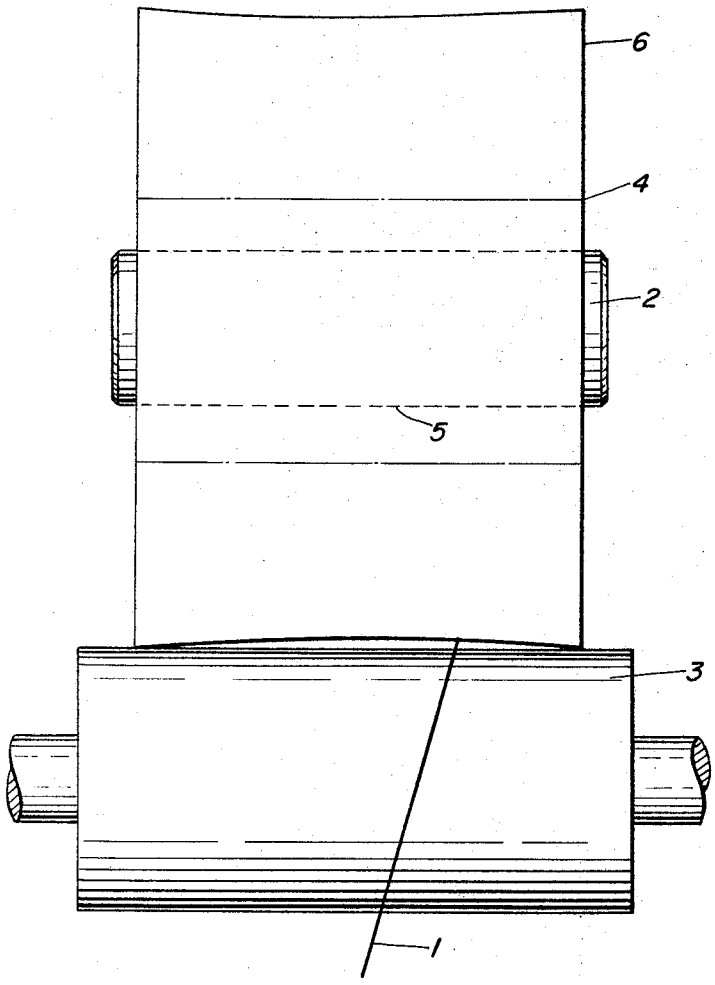

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PROCESS FOR THE FORMATION OF DENSE WINDING BODIES

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ABSTRACT OF THE DISCLOSURE

A process for winding bobbins in which the circumferential speed of the winding bobbin is increased by from 2% to 3.6% from the beginning to the end of the winding process. The increase in circumferential speed can be initiated immediately after the start of the winding operation or at some other definite point in the program.

The present invention relates to a process for the winding of endless synthetic threads delivered at a constant speed onto bobbins in cross-winding, the winding bobbin being driven by a drive roller in frictional contact with its circumference.

In the usual winding processes the rate of rotation of the drive roller is constant from the beginning to the end of the winding process. Additionally, the circumferential speed of the drive roller with respect to that of the bobbin body is higher by about the amount that is lost due to slippage between the surfaces of the two rotary bodies. In this way the circumferential speed of the winding body remains approximately constant until the end of the winding process, which speed is determined by the required thread tension. Wound bodies of the usual type and size processed in this manner have, in general, sufficient density and strength of winding structure for the processing to follow.

In certain cases, however, as, for example, in the production of supply bobbins of relatively great winding diameter or volume, or where the bobbins have to be transported over relatively long distances for further processing, considerably greater demands are made on the density and strength of the winding structure. Unless improvements are made in the winding structure further processing or handling may cause the thread windings or layers loosened from the exposed surface to become disengaged, or the wound bodies will be deformed and damaged in transportation and thus become unusable.

The production of really secure, hard bodies in cross-winding, however, according to the drive-roller winding process described above, is very difficult especially with synthetic threads delivered at a constant rate. This has been achieved previously for relatively large winding volumes or diameters only under conditions wherein unacceptable high thread tension fluctuations are encountered. Immediately after the distributing of a few thread layers on the spool, a saddle begins to be marked off on the winding surface, which cannot be avoided by conventional methods, for example, by accelerating the traverse speed at the reversing places. In the course of the further winding process a constriction of the winding is formed which gradually increases as the ends of the winding become thicker. In the usual, more or less loose buildup of the body, these differences in the winding diameter are approximately compensated by the pressure of the drive roller on the winding circumference or of the winding pressing against the drive roller. In the formation of firm bodies on the other hand, due to differences in the winding speeds at the particular run-on points along the winding length, the winding diameter grows somewhat more

rapidly at the ends of the body than in the middle and, therefore, the pressure of the drive roller or winding no longer suffices to even out and balance the winding surface. Inasmuch as the drive roller has effective contact only with the ends of the body and, accordingly, drives the winding with the slower speed corresponding to this larger winding diameter, the circumferential velocity of the winding lags in the saddle extending over its middle portion as compared to the desired winding speed. As a consequence of these speed differences, necessarily the thread tension at which the thread is wound also fluctuates. These thread tension differences, as the winding diameter becomes greater, become so high and the level of the mean thread tension is lowered so severely that the thread finally jumps out of the thread guide in reciprocating movement before its run onto the bobbin, thereby disturbing the winding process or making impossible its completion.

The present invention, therefore, has as its objective the elimination of the above drawbacks or the reduction of the existing difficulties to such a great extent that in the winding of fine and extremely fine endless synthetic threads delivered at a constant speed to bobbins driven by means of drive rollers there result cylindrical winding bodies of great volume and/or diameter and of very high density, while maintaining a thread tension that is at least approximately constant.

In order to achieve this it is proposed, according to the invention, that the circumferential speed of the winding bobbin driven by the drive roller be raised continuously or in stages during the winding process by means of a control or regulating device in such a manner that at the end of the winding process it is greater by from about 1.5 to 5%, and preferably by about 2% to 3.6% than at its beginning. The increase of the circumferential velocity of the winding bobbin can be initiated immediately after the start of the winding operation. It is also possible, however, to have the increase of the velocity commence only after the expiration of a certain winding time. Expediently, the increase of the circumferential speed is begun, say, on reaching a sixth to a quarter of the desired final winding thickness, but advantageously always when the saddle formation begins to develop.

In prior art methods, the drive speed remains constant from the beginning to the end of the winding process or, in consideration of the slightly increasing slip between the drive roller and the bobbin as the winding weight grows, remains at least approximately constant. The present process makes it possible to counter the slippage between the drive roller and bobbin very effectively. Additionally, in the subject method the thread tension level which decreases as a result of the saddle formation as the winding diameter increases, is again raised to such an extent that very firm spool bodies with large outside diameters and, accordingly, also great winding volume, can be produced. Since, on the one hand, the thread delivery speed is always somewhat greater than the tangentially running circumferential speed of the bobbin because of the thread traverse speed directed parallel to the bobbin axis, and, on the other hand, the traverse speed at the bobbin ends always passes through zero, at these places the circumferential velocity of the winding can reach the magnitude of the delivery speed of the thread without there occurring any tension increase in the thread. Accordingly, the thread tension fluctuations in the winding process according to the invention, both within each individual traverse cycle and also with respect to the increasing winding diameter, are kept within narrow, tolerable limits from start to finish of the winding process, whereby, too, a jumping of the thread out of the thread guide and the disadvantages associated with this are pre-

vented from the outset. The wound body produced in this manner has a high density and the strength of the winding structure offers the possibility of considerably increased winding volume.

The devices necessary for the execution of the proposed process can be of various types and may consist essentially of known mechanical and/or electrical means which are suitable for the control or regulation of the drive roller turning rate for the purpose of increasing the circumferential speed of drive roller and bobbin in dependence either on the particular diameter of the winding body or simply on the winding time or the tension of the thread running onto the bobbin.

The increasing of the circumferential speed of drive roller and bobbin can be accomplished, for example, by frequency change of the feed main for the drive motor of the drive roller. In this system the frequency alteration can be controlled in accordance with the growth of the winding diameter corresponding to the measure of the deflection of the winding arm carrying the bobbin over a mechanical or electrical control drive. Likewise, the increase of the circumferential velocity of drive roller and bobbin may be accomplished very simply by a time switching mechanism. For this purpose there may be used commercially available electric control clocks, such as are used, for example, in heating system regulating installations.

A further possibility for the speed change consists, for example, in carrying out the increase of circumferential velocity of drive roller and bobbin over a closed regulating circuit with thread tension feelers, by which the turning rate of the drive motor of the drive roller is corrected in independence on the mean thread tension by an arrangement such that the thread tension feeler gives its regulating impulses directly or indirectly over an amplifying device to an adjusting member which brings about, for example, a brush displacement or field change of the drive motor of the drive roller.

Inasmuch as the subject method can be carried out by making only minor alterations to existing devices, no great expense is involved in practicing the invention.

The attached schematic drawing will help illustrate the subject invention. In the drawing, thread **1** is wound as usual on bobbin **2** driven by the drive roller **3**. The turning rate of the drive roller is adjusted in such a way that the winding speed of the thread on the bobbin is greater than the thread delivery speed by that small amount which barely yields the required thread tension in the running of the thread onto the bobbin. Here there must be taken into account also the slip occurring between the drive roller and the bobbin. Immediately after the start of the winding process or after a certain winding thickness **4** has been reached which, according to experience, lies in winding bodies of usual outside diameter, at about a sixth to a quarter of the winding thickness of the finished winding, and at which point already a saddle **5** is marked out over the middle portion of the bobbin length, the circumferential speed of the drive roller and thereby also of the bobbin is increased, either continuously or in stages, in such a way that at the end of the winding process, after the body is brought to the required final winding thickness **6**, it is preferably about 2% to 3.6% greater than at its beginning. The saddle depth increasing as the winding grows is represented in the drawing, for the sake of vividness, with exaggerated depth. In bodies of 360 mm. outside diameter it amounts to about 2 mm. In the production of bodies with larger outside diameter the saddle formation is marked even earlier, for example, on reaching 10 or 15% of the final winding thickness, and the increase of the circumferential velocity must start at least by this point. In this manner bodies of very high strength and density of the winding structure and with approximately constant thread tension level from start to finish can be produced with a winding volume as large as desired, of, for example, 10, 15, 20 kg. and more in weight, with an outside diameter of 360, 400 mm. and more.

Obviously many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A process for winding synthetic threads delivered at a constant velocity onto bobbins in cross-winding which comprises: driving the winding bobbin by a drive roller in frictional contact with the circumference of the winding body, increasing the circumferential speed of the drive roller from the beginning of the winding operation to the end of the winding operation by from about 2 to 3.6%.

2. A process of winding synthetic threads delivered at a constant velocity onto bobbins in cross-winding which comprises: driving the winding bobbin by a drive roller in frictional contact with the circumference of the winding body, increasing the circumferential speed of the drive roller constantly from the beginning of the winding operation to the end of the winding operation by an amount such that the speed is from 2 to 3.6% greater at the end of the winding operation than at the beginning of the winding operation.

3. A process for winding synthetic threads delivered at a constant velocity onto bobbins in cross-winding which comprises: driving the winding bobbin by a drive roller in frictional contact with the circumference of the winding body, increasing the circumferential speed of the drive roller after the body has reached from one-sixth to one-quarter of its final diameter from the begining of the winding operation to the end of the winding operation by an amount such that the speed is from 2 to 3.6% greater at the end of the winding operation than at the beginning of the winding operation.

4. A process for winding synthetic threads delivered at a constant velocity onto bobbins in cross-winding which comprises: driving the winding bobbin by a drive roller in frictional contact with the circumference of the winding body, increasing the circumferential speed of the drive roller as soon as a saddle begins to form in the winding body, the speed being increased by an amount such that the speed is from 2 to 3.6% greater at the end of the winding operation than at the beginning of the winding operation.

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