

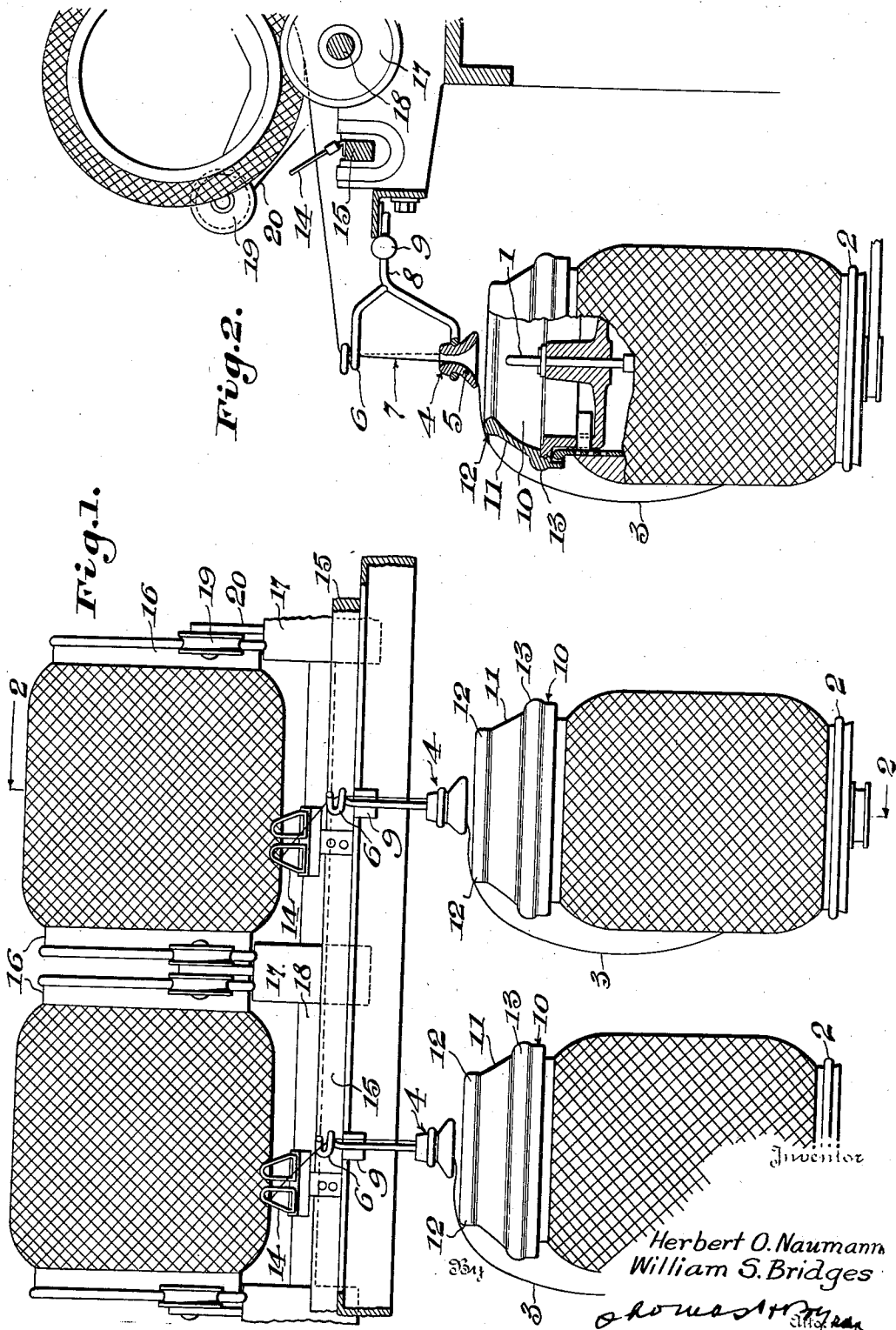
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METHOD AND APPARATUS FOR THE TWISTING OF THREAD

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METHOD AND APPARATUS FOR THE TWISTING OF THREAD

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The present invention relates to the winding and twisting of thread or yarn but more particularly has for its object to devise a novel process and apparatus to improve the quality of the thread and eliminate damage thereto during the twisting operation.

In the twisting of thread it is the practice, particularly where upstroke twisters are used, to draw the thread through a guide centered above the rotating supply spool. The thread after passing through the guide is passed to the usual reciprocating traverse guide to the winding or takeup spool.

The twisting spool rotates on its vertical axis at speeds as high as 8,000 and 10,000 R. P. M. The thread as it unwinds from the twisting spool balloons outwardly and up to the guide centered above the said spool. At these high speeds of rotation it is obvious that the thread balloon is subjected to considerable stress and that damage to the thread is almost inevitable.

As is well known, a thread is composed of numerous smaller threads which together form the thread body and it is not at all unlikely that separation of these threads may take place and cause defects in the finished thread due to the forces exerted on these smaller threads during the twisting operation.

In order to visualize with what speed the thread balloon may be traveling and without considering wind-resistance, vibration and the injurious effect on the yarn when the balloon contacts the separator plates between the different spindles, the following example will illustrate the speed with which the thread balloon travels.

Assuming a balloon diameter of 8 inches, the balloon travels 25 inches in circumferential distance or 0.7 yard in one revolution. With a spindle speed of 4200 R. P. M. the balloon travels 4200×0.7 yard which equals 3220 yards per minute or 110 miles per hour. It is quite evident from these figures that an extremely high force will be exerted on yarn traveling in a straight path and that the force will be considerably greater when the yarn travels in a circular path as is the case with the thread balloon.

When it is realized that the yarn coming from the twisting spool is untwisted, as is the case with artificial silk threads, with the smaller threads comprising the thread body in parallel relation, it will be obvious that air friction at the high speed of rotation of 110 miles per hour will tend to separate the individual smaller threads to form loops and make it extremely difficult and practically impossible to obtain a uniform twist.

Furthermore, those filaments which are looped and extended beyond the confines of the thread proper and which are of such fineness, as for example, 1.5 denier, are readily broken by the force exerted on the thread in its high rotative speed of travel. These smaller threads when broken and drawn over the twisting guide are wound back on the thread body and twisted therearound forming thickened places in the yarn. Such thickened places are glaringly apparent in the finished fabrics made from yarn having such defects and have the appearance of a corkscrew, hence the name of such places in the thread has been termed "corkscrews."

Even in those instances where the loops formed by the twisting operation are not broken, such loops are twisted in with the body of the thread forming other thickened places in the yarn which may and do interfere with the knitting and weaving operations when the thread is formed into fabrics.

These imperfections, such as corkscrews and loops, not only result in imperfect fabrics but also increase the cost of production thereof in that breakage frequently occurs at these points causing the fabric machines to be stopped until such breaks are repaired.

It is therefore one object of the present invention to devise a novel process and apparatus to improve the quality of twisted yarn.

Another object of the present invention is to devise a process and apparatus which will result in a uniformly twisted thread.

These and other objects will in part become obvious and will in part be pointed out in the following specification when studied in connection with the attached drawing, in which:

Fig. 1 is a front elevation of a part of a twisting machine with the device comprising the invention in operative position thereon, and

Fig. 2 is a cross-sectional view on the line 2—2 of Fig. 1.

In the drawing, in which like numerals of reference indicate like parts, 1 refers to the twisting spindle on which is mounted the supply spool 2 from which the yarn 3 is drawn. This supply spool 2 rotates at high speed with the twisting spindle 1 and is termed the twisting spool.

In the invention the yarn 3 is drawn from the twisting spool 2 up and through a funnel guide 4. This funnel guide 4 is so designed as to give the least resistance for the balloon travel of the thread and at the same time offers the least resistance to the thread as it collects in the twisting area.

The profile of the inside surface 5 of the funnel guide conforms to a curve which is known as Schiele's anti-friction curve.

Spaced above the funnel guide 4 and centered on the axis of the said guide is positioned a guide eye 6. The position of this guide eye is such as to lead the thread, coming from the funnel guide, in the path of least resistance. As indicated at 7 the thread in its rotation describes a cone with its base formed by the upper inside surface of the funnel guide and its apex at that point where the thread is carried over the guide eye 6.

The funnel guide 4 and the guide eye 6 are mounted on an arm 8 pivotally mounted at 9. Guides made and positioned on the twisting machines in this manner were found to eliminate looping of the thread and to result in a uniformly twisted thread.

By passing the thread through the funnel guide 4 and up to the guide eye 6 in a path of least resistance the threads comprising the thread unit which may have been separated due to the velocity of rotation of the twisting balloon are realigned in parallel relationship making it possible to impart the necessary uniformity of twist. Furthermore it has been found that a true cable twist results whereas heretofore only a flat or ribbon twist was achieved.

The use of the guide arrangement discussed hereinbefore in this application did much to eliminate non-uniform twists and loops but did not entirely do away with broken filaments and corkscrew thicknesses in the yarn resulting therefrom. In order to overcome the corkscrews caused by broken filaments it was found necessary to control the balloon diameter so that vibration of the thread due to drawing the thread alternately from the lower end to the upper end of the twisting spool would be eliminated. It was also found that as the yarn came off alternately from the lower and upper ends of the twisting spool that the diameter of the balloon changed causing the thread to frequently strike the sides of the separator plates. Removal of the separator plates from between the twisting spindles, however, was found insufficient to overcome breaking of the filaments.

It was further found that as the end of the balloon coming from the spool moved upwardly and downwardly that a whipping action took place which tended to spread or separate the individual filaments which obviously caused broken filaments with the resulting corkscrews or as the case may be certain of the filaments would loop outwardly and when twisted would wind back upon the thread. It was therefore believed necessary to control the balloon diameter and in order to reduce the centrifugal force applicants felt that it would solve the problem if the diameter of the balloon were reduced at the same time. They therefore conceived the idea of lowering the thread guide to a point which would bring the balloon in constant contact with the twisting cap. In order to accomplish this result it was felt that the cap should be so designed that a minimum of friction would result.

As illustrated in the drawing a cap 10 is shown having an outer surface 11 which tapers inwardly and upwardly in a direction which conforms somewhat to the general direction taken by the thread balloon as it is drawn inwardly by the funnel guide 4.

The tapering surface 11 of the cap 10 has formed thereon upper and lower rounded pro-

jecting surfaces 12 and 13 which encircle the cap 10. It is these surfaces with which the thread 3 contacts. As shown in Fig. 2, the upper projecting surface 12 is appreciably smaller in diameter than the lower surface 13 of the tapered cap 10.

The upper surface 12 is always in contact with the thread 3 whereas the lower surface 13 only contacts the thread as the balloon moves downwardly.

By always having the thread 3 in contact with the surface 12 the twisting action on the thread which takes place between the surface 12 and the guides 4 and 6 is prevented from being carried back through the balloon to the yarn body. Obviously if the twist were allowed to extend back to the yarn body uneven twist would result due to the changing balloon length as the thread is drawn alternately from the upper and lower ends of the yarn body.

A further advantage in the twisting arrangement disclosed in this invention is gained by reason of the lowering of the thread guide 4 to a point where the thread coming from the cap surface 12 follows an almost horizontal course. In so doing the centrifugal force exerted on the thread is approximately lengthwise of the thread so that separation of the individual filaments is rendered practically impossible. Further, due to the reduced diameter of the thread balloon prior to the passage of the thread over the surface 12 there is little opportunity of the filaments becoming separated because of wind resistance.

The threads 3, as shown in the drawing, after passing through the guide eye 6 is passed through a thread guide 14 which is mounted on the usual type of reciprocated traverse bar 15. Collecting spools 16 are provided to take up the twisted thread.

The take-up spool 16 rests on drive rollers 17 mounted on a drive shaft 18 which is driven in any suitable manner.

The take-up spools 16 are held in position on the drive rollers 17 by grooved rollers 19 mounted in brackets 20.

This latterly described mechanism is of the usual type used in the art.

The essence of the present invention may be said to comprise controlling and reducing the balloon diameter in order to obtain more uniform conditions for the yarn during the time it is acted upon by the greatest force, causing the thread to pass through the twisting area in a path whereby all resistance and friction are reduced to a minimum in order to allow realignment of the separate threads forming the yarn body and to further prevent the twist being carried back to the varying portions of the balloon whereby uniform twist in the thread is insured.

It is obvious that many variations may be made in utilizing the above described invention and it is not intended to limit it to the particular embodiment shown and described as illustrative of a single application of it. The terms used in describing the invention have been used in their descriptive sense and not as terms of limitation and it is intended that all equivalents thereof be included within the scope of the appended claims.

We claim:

1. In a method for the twisting of thread the steps comprising providing a constant length twisting zone by constantly contacting a portion of the balloon from the inside, drawing the thread

radially inwardly from the point of contact in an approximately horizontal path, and thereafter causing the thread to follow a path of least resistance through the twisting area.

2. In a method for the twisting of thread the steps comprising controlling the balloon diameter of the thread as it unwinds from the twisting spool, constantly supporting the balloon from the inside as it rotates, drawing the thread radially inwardly from the point of support in an approximately horizontal path, drawing the thread upwardly to a take off point in such a way that the rotating thread describes a cone with its apex at the take off point, and then collecting the thus twisted threads.

3. In a method for the twisting of thread the steps comprising controlling the balloon diameter of the thread as it unwinds from the twisting spool constantly supporting the balloon from the inside as it rotates, drawing the thread radially inwardly from the point of support in an approximately horizontal path, then drawing the rotating thread through a surface whose profile conforms to Schiele's Anti-friction Curve, thereafter drawing the thread to a take-off point whereby the thread describes a cone with its apex at the take off point, and then collecting the thus twisted threads.

4. In a method for the twisting of thread as the thread unwinds from a twisting spool, the steps comprising controlling the balloon diameter of the thread as it unwinds from the twisting spool by constantly supporting the balloon from the inside as it rotates, drawing the rotating thread upwardly through a guiding surface centered above the said twisting spool, and thereafter drawing the thread to a take-off point centered above said guiding surface whereby the thread is caused to describe a cone with its apex at the said take-off point.

5. An apparatus for the twisting of thread comprising, in combination, a rotating twisting spool from which thread is drawn off, a cap mounted on said spool and rotatable therewith, a thread guide positioned above said spool and in axial alignment therewith through which said thread passes, the inner surface of said thread guide tapering from bottom to top, a second guide centered above said first mentioned guide, and means to draw said thread from said spool and through said guides.

6. An apparatus for the twisting of thread comprising, in combination, a rotating twisting spool from which thread is drawn off, a cap mounted on said spool and rotatable therewith, a thread guide positioned above said spool and in axial alignment therewith through which said thread passes, said guide having an opening therein, the profile of said opening conforming to Schiele's Anti-friction Curve, a second guide positioned above said first mentioned guide and in axial alignment therewith, and means to draw said thread from said spool and through said guides.

7. An apparatus for the twisting of thread comprising, in combination, a rotating twisting spool from which thread is drawn off, a cap

mounted on said spool and rotatable therewith, a thread guide positioned above said spool and in axial alignment therewith through which said thread passes, said guide having an opening the profile of which conforms to Schiele's Anti-friction Curve and tapering from the bottom of said guide to the top thereof, a second guide positioned above said first mentioned guide and in axial alignment therewith, and means to draw said thread from said spool and through said guides.

8. An apparatus for the twisting of thread comprising, in combination, a rotating twisting spool from which yarn is drawn off, a cap mounted on said spool and rotatable therewith, a thread guide positioned above said spool and in axial alignment therewith, said guide being so positioned as to draw the thread over said cap inwardly in an approximately horizontal course, and means to draw said thread from said spool and through said guide.

9. An apparatus for the twisting of thread comprising, in combination, a rotating twisting spool from which thread is drawn off, a cap mounted on said spool and rotatable therewith, said cap tapering inwardly and upwardly, a thread guide positioned above said spool and in axial alignment therewith through which said thread passes, said thread guide so positioned as to cause yarn drawn over said cap to be drawn radially inwardly in an approximately horizontal course, and means to draw said thread from said spool and through said guide.

10. An apparatus for the twisting of thread comprising, in combination, a rotating twisting spool from which thread is drawn off, a cap mounted on said spool and rotatable therewith, said cap tapering inwardly and upwardly, said tapering surface having formed thereon upper and lower projecting surfaces which encircle said cap, a thread guide positioned above said spool and in axial alignment therewith through which said thread passes, said thread guide so positioned as to cause yarn drawn over said cap to be drawn radially inwardly in an approximately horizontal course, and means to draw said thread from said spool and through said guide.

11. An apparatus for the twisting of thread comprising, in combination, a rotating twisting spool from which thread is drawn off; a cap mounted on said spool and rotatable therewith, said cap having formed exteriorly thereon rounded upper and lower projecting surfaces which encircle said cap, the upper projecting surface being of appreciably smaller diameter than the lower one; a thread guide positioned above said spool and in axial alignment therewith through which said thread passes, said thread guide being so positioned as to cause yarn drawn over said cap to be drawn radially inwardly in an approximately horizontal course; and means to draw said thread from said spool and through said guide.

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