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PROCESS AND APPARATUS FOR TWISTING RAYON

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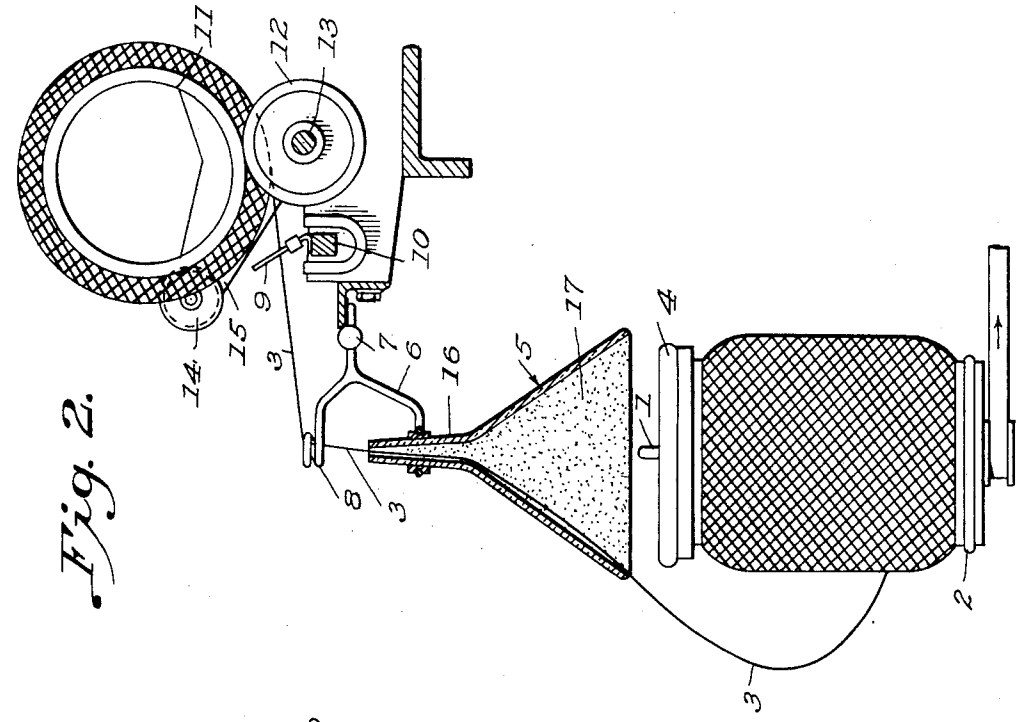


Fig. 2.

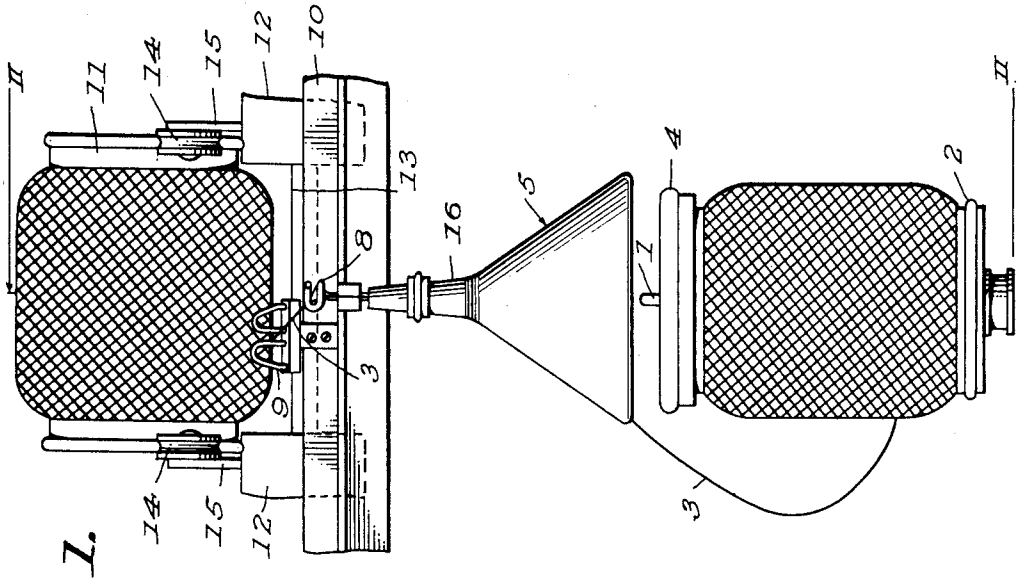


Fig. 1.

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PROCESS AND APPARATUS FOR TWISTING RAYON

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5 Claims. (Cl. 57—62)

The present invention relates to the twisting of yarn and is particularly concerned with an improved method and apparatus for twisting yarn in accordance with the up-stroke twisting process.

The up-stroke twisting process is one in which the untwisted yarn is fed from a spool supported on a vertical revolving spindle and is drawn upwardly through guiding members centered above the rotating supply spool. From the guiding members the thread is passed to the usual reciprocating transverse guide and then wound onto a take-up spool which is rotated about a horizontal axis.

In ordinary practice the vertical or twisting spool rotates on its 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 members centered above said spool. At these high speeds of rotation it is obvious that the thread balloon is subjected to considerable destructive stress and that damage to the thread is almost inevitable. This holds true particularly when fine filament yarn of artificial origin is twisted by this method. Such yarn is composed of a great number of fine individual filaments of, for example, 1.5 denier or even less. It will also be obvious that due to the high rotational speed of the vertical twisting spool the thread balloon formed around the latter moves at high linear speed and is, therefore, subjected to great air friction. This air friction frequently causes separation of individual filaments from the yarn body. These separated filaments form loops in the yarn, or are caused to break, and when broken are wound back on the thread body and twisted therearound forming thickened places in the yarn. Such thickened places are clearly visible in the finished fabric and have the appearance of cork-screws; hence such irregularities in the thread have been termed "cork-screws."

Imperfections, such as cork-screws 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 making machines to be stopped until such breaks are repaired.

Hitherto, it has been proposed to employ a guide member of inverted funnel shape around the upper end of the twisting spool to modify the thread balloon at its upper portions and to provide a continuous and relatively smooth guide surface. When the funnel is made of materials such as glass, Bakelite, lacquered paper, and lacquered metal, generally satisfactory results are obtainable in twisting by the up-stroke process so long as the operation is limited to relatively heavy threads having a denier in excess of 200. Below the size specified unexpectedly poor quality twisted thread has been produced with the foregoing apparatus of the prior art.

To meet this problem it has been necessary to experiment extensively with materials for the guiding surface and to determine its optimum size and position. However, no satisfactory progress was made with light threads, namely, those of less than 200 denier, until marked changes had been made in the character of the interior funnel or conical thread guiding surface.

The satisfactory solution of the outlined problem with the overcoming of the objections noted is embodied in the present invention which will be set forth in detail.

Therefore, it is an 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 substantially prevent the formation of loops and cork-screws in twisted yarn under certain specified conditions.

In the accomplishments of these objects, a feature of the invention consists in the provision of thread guiding means of inverted funnel shape with an interior surface having smooth, fine, closely-spaced projections which are incapable of injuring the yarn.

Other features of improvement are to be recognized in the specific shape of the thread guiding means and in its arrangement with respect to the twisting spool.

Further novel features of improvement contributing to ease of control and uniformity in results will be perceived and readily understood from the following description in detail of an illustrative embodiment of the invention in connection with the accompanying drawing, in which

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

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

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

twisting spool. A cap 4 securely locks the twisting spool 2 to the spindle 1.

In the practice of this invention, the yarn 3 is drawn from the twisting spool 2 up and through guide means in the form of an inverted funnel 5 positioned completely above the twisting spindle 1 and centered on the axis thereof. The funnel 5 may be mounted as shown on an arm 6 which is joined at 7 to a stationary portion of the twisting machine in a manner which permits pivotal adjustment.

Spaced above the guide member or funnel 5 and in central alignment therewith is a guide eye 8 which may also be supported by the arm 6 for pivotal movement with said funnel.

The thread 3, as shown in the drawing, after passing through the guide eye 8 extends more or less horizontally through a thread guide 9 which is mounted on a conventional reciprocating traverse bar 10. A collecting spool 11 is ordinarily provided to take up the twisted thread after it leaves the thread guide 9.

The take-up spool 11 rests at opposite ends on a pair of driving rollers 12, 12 mounted on a drive shaft 13 which may be driven in any suitable manner. In the twisting machine which is illustrated the take-up spool 11 is held in position on the driving rollers 12 by grooved rollers 14 rotatably supported on brackets 15.

Particular reference will now be made to the physical characteristics and functional capacity of the inverted funnel guide means 5. It is to be noted that the funnel 5 has the regular form of a frusto-conical shell with a tapered, tubular spout section 16 extending as a continuation from its smaller or apex end. The outer surface shape of the funnel guide means 5 is of no particular moment with respect to its function, its conformation being dictated solely by ease of manufacture and economy of material. Any suitable material such as glass, porcelain, Bakelite or metal may be used for the funnel 5, although the first-mentioned has been found particularly advantageous from every standpoint.

Attention is directed to the relation of the funnel 5 to the twisting spool 2 which the drawing plainly illustrates. At its base end, which is adjacent the twisting spool 2, the funnel 5 is made slightly larger in interior diameter than the end of said spool and is arranged in coaxial position a short distance thereabove. In actual practice the distance has been varied from approximately one-half to two inches (½–2″) with satisfactory results.

Fig. 2 illustrates to some extent the nature of an inside surface 17 which characterizes the funnel guide means 5. The surface 17 may be obtained by sandblasting or finely etching, as by chemical treatment, the entire inside of the thread guide means 5. By so doing an abraded surface is produced which is roughened to the extent that minute projections which are finely spaced cover it, but these minute projections or surface irregularities are so smooth that they will not injure or materially modify the thread during twisting.

While it is known in the art that a wool-like or similar irregular appearance may be given to thread manufactured from continuous filaments by passing such tread over a variety of surfaces which will tear the individual filaments, that practice is squarely opposed to the ends contemplated by the presently disclosed invention. Since it is the purpose of the invention upon which this application is based to preserve rather than change the regular characteristics of the twisted thread, any term which may be employed to describe the novel twisting treatment or guide means of the applicant is intended to define surfaces which are incapable of injuring the thread during such treatment.

Before summarizing the twisting procedure and the manner of operation of the apparatus characterizing this invention, attention is directed to the tapered spout section 16 of the funnel 5 as an optional detail, for reasons which will be stated.

Referring to the drawing, as the thread 3 unwinds from its yarn holder or twisting spool 2 in response to rapid rotation of the latter, it balloons around said spool and is drawn upwardly into the inverted funnel guide means 5 where it passes over the uneven inside surface 17 with a compound relative motion of both rotation and translation. It will be apparent that the ballooning is repressed when the thread enters funnel 5 and that the enclosing of the thread 3 at this point tends to reduce the effect of air friction.

In addition to affording convenient means for supporting and maintaining the funnel guide means 5 in a centered position, the tapered spout section 16 serves also to keep the thread moving uniformly over the conical guide surface without interference due to reversal of position of the reciprocating thread guide 9.

It is obvious that many variations may be made in utilizing the above described invention, and for that reason it is not intended to limit the same to the particular embodiment shown and described as illustrative of a single application.

The terms employed 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.

What we claim is:

1. In an apparatus for the twisting of thread by the up-stroke twisting process whereby the thread is subjected to ballooning; a rotating twisting spool from which thread is drawn off; an inverted, hollow, funnel-shaped member positioned above said spool and in axial alignment therewith through which the thread is passed, said member having an abraded inside surface and being constructed to permit the movement of the thread around the entire inside surface thereof while it passes therethrough, said surface being incapable of injuring said thread; and take-up means for collecting the thread.

2. An apparatus as set forth in claim 1 characterized in that the diameter of the large end of the funnel-shaped member is greater than the diameter of the twisting spool.

3. In an apparatus for twisting of thread by the up-stroke twisting process, in combination, a rotating vertical spindle; a yarn holder supported on said spindle and from which thread is drawn off; a hollow, funnel-shaped member positioned coaxially above said yarn holder with its large end facing towards the upper end of said yarn holder and being larger in diameter than said yarn holder, said member having an abraded inside surface adapted to support the thread while it passes through said member, said surface being incapable of injuring the thread while passing thereover; and means to draw the thread from said yarn holder and through said member.

4. In an apparatus for the twisting of thread by the up-stroke twisting process whereby the thread is subjected to ballooning, a rotating

twisting spool from which thread is drawn off; an inverted, hollow, funnel-shaped member positioned above said spool and in axial alignment therewith through which the thread is passed, said member having an inside surface which possesses the abraded characteristics produced by sandblasting or etching and said member being constructed to permit the movement of the thread around the entire inside surface thereof while it passes therethrough, said surface being incapable of injuring said thread; and take-up means for collecting the thread.

5. In a process for the production of twisted, multifilament threads by up-stroke twisting, the steps comprising unwinding a multifilament, untwisted thread from a thread package to form a thread balloon by centrifugal force and causing the upper portion of said thread balloon to pass over a funnel-shaped abraded surface to form a twisted, multifilament thread substantially free from broken filaments, cork screws and loops, and then collecting the thread, said thread being not in excess of 200 denier.

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