Oct. 7, 1958 A. H. BURKHOLDER 2,854,814

METHOD AND APPARATUS FOR THE PRODUCTION OF BULK YARN

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Fig. 1.

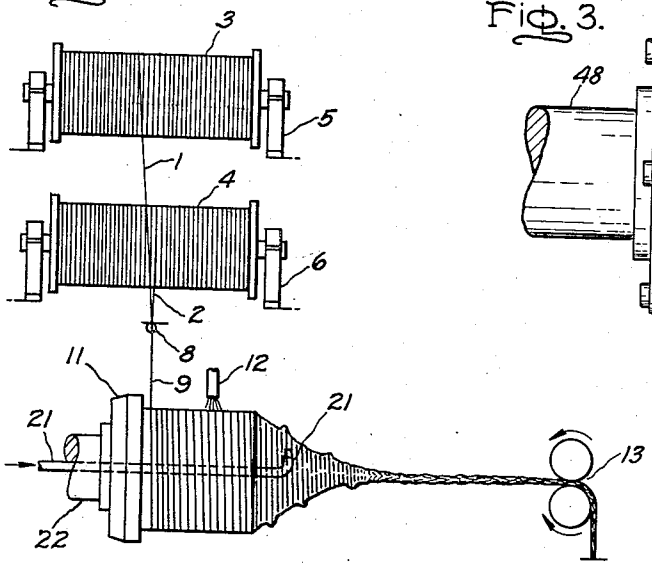


Fig. 3.

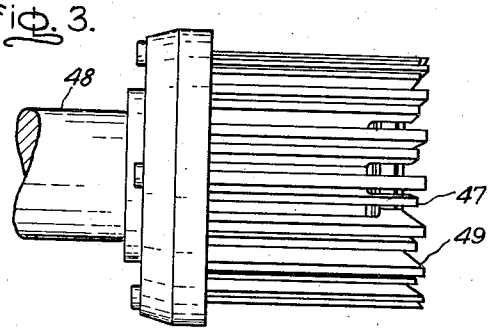
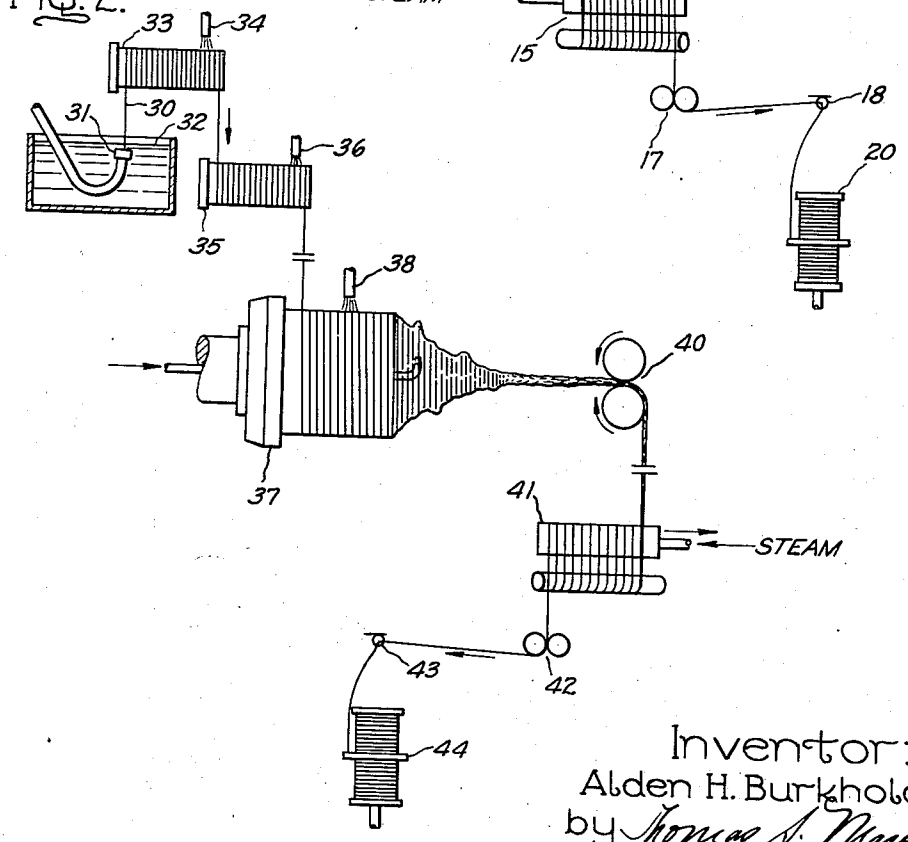


Fig. 2.



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METHOD AND APPARATUS FOR THE PRODUCTION OF BULK YARN

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7 Claims. (Cl. 57—164)

This invention relates to a method and apparatus for the production of bulk yarn. More particularly the invention relates to a method and apparatus for preparing a bulky yarn from continuous multi-filament yarn axially withdrawn from a rotating helix, forming an enmeshed, twisted, tubular structure that is drawn into a strand having bulk properties.

Continuous filament yarns may be advantageously utilized in the production of bulk yarn since there are no loose ends in such yarns that are unable to carry imposed stresses, and bulk yarns thus made because of continued uniformity, are denser as well as stronger. Filter maerials of various types can be made from such bulk yarns because of their characteristic to compactness; they can be utilized for insulation purposes, for tying yarns or string, and for crocheting or knitting purposes.

Various methods are utilized in manufacturing bulk yarn, sometimes called textile yarn. One of the methods is drawing yarn over a sharp edge which tends to induce curling into the fibers comprising the yarn; another method is imparting a crimp to the yarn and then setting the crimp by heat or some other means; still another method comprises imparting a stretch to some of the filaments of the yarn then relaxing them to thus increase the bulk of the yarn; and still another method comprises forming of loops in the filaments as the yarn moves across a high pressure air jet. The applicant's method differs from the aforesaid methods in that high bulk yarn is formed directly from a multi-filament yarn being processed while in the form of a helix, advantageously on a continuous spinning apparatus. By producing bulk yarn on a continuous process apparatus subsequent separate handling and the need of special creels and other equipment is avoided.

More specifically the bulking of multi-filament yarn is effected with the yarn being advanced in a helix while still damp then being pulled off the free or unsupported end of a thread-advancing reel along the axis of the rotating helix. The extent of the bulkiness of the yarn is determined by the rate of axial pull of the yarn out of the rotating helix. The method of this invention and the apparatus will be more fully described in the following specification and the accompanying drawing; where

Figure 1 represents one form of apparatus embodying the method for forming a mixed bulk yarn;

Figure 2 represents, schematically, an apparatus for producing a bulk yarn by continuous spinning; and

Figure 3 represents a thread-storing, thread-advancing device utilized in the bulking of yarn.

Bulk yarn may be of the same color, same denier, same fibers; however, where bulk yarn having a different appearance or a varied characteristic is required, then more than one supply of yarn can be utilized. Thus, as shown in Figure 1, two different kinds of yarn 1 and 2 are provided, each being supported on yarn spools or beams 3 and 4 that are individually supported in strands 5 and 6. Yarn 1 coming from beam 3, and yarn 2

coming from beam 4, are combined by means of a guide 8 to form a single strand 9 before being advanced over a thread-storing, thread-advancing reel 11 in the form of a helix. The combined yarns forming a single strand 9, while being advanced in the form of a rotating helix over the periphery of the reel 11 are, desirably, subjected to a wet processing treatment 12 which may be a finishing treatment, or any other wet treatment, before it is withdrawn from the forwarding of the reel 11 along the reel axis. As the strand 9 is taken off the forward end of the reel 11, the filaments of the strand tend to entwine and twist upon themselves to form a continuous tube-like structure that is drawn off along the reel or helix axis at a rate giving the desired bulkiness to the final yarn.

The drawing rollers 13 continuously withdraw the multi-filament strand 9 at a rate which will give a desirable initial size, then the bulked yarn or strand is directed to a further thread-storing and advancing reel 15 of a double roller type, providing for greater pitch because of an increased strand size, whereon it is dried. A stretch can be imparted to the bulked yarn between the withdrawing rollers 13 and the drying reel 15. After the yarn is dried on the reel 15 it is led to drawing or forwarding rollers 17 then through guide 18 to a take-up device 20. A further final stretch of the bulked strand to the desired approximate denier is effected after it is dried. Such further stretch is imparted between the drying reel 15 and the rollers 17. The take-up device 20 can be a down-twist type as a ring-twister to give the bulked strand an additional twist. If no additional twist is required, the yarn can be collected onto a package posititoned in any known manner horizontally and laid thereon by any of the well-known traverse type of laying guides.

Where increased bulkiness of yarn is desired it can be provided by means of intermittent air or steam blasts from within the periphery of the conical section of the tubular drawn-off strand 9 ahead of the thread-advancing reel 11 but before the tube-like section is pulled into strandular form. The blast of air or steam, or other gases or liquid fluids, may be provided through the core of the reel 11 as through its shaft 22 to the position where it is to be desirably applied. As shown in Figure 1 a conduit 21 is provided within the core of the thread-advancing reel 11 energing from the front end of the reel. The fluid utilized, such as air or steam, is emitted at desirable intervals; the intermittent blasts raise that section of the tube-like bulk yarn that is impinged and the raised portions are fixed in the yarn length by being twisted thereinto by the rotation of the reel giving surface protuberances which lend a further bulkiness in the final yarn.

Bulk yarn can be advantageously produced by a continuous process as generally shown in Figure 2 of the drawing. Multi-filament yarn 30 formed by the known viscous process by extruding a viscose solution through a spinneret 31 positioned in an acid coagulating bath 32 is withdrawn by a thread-storing, thread-advancing reel 33. The yarn is advanced on the reel 33 and on subsequent reels 35, 37, 41 in the form of a helix; meanwhile it is being subjected to desirable regenerating and other treatments 33, 36 and 38.

The yarn 30 is withdrawn from the front part of the reel 37 in the form of a tube by an entwining and an entwisting of the filaments as they slip off the reel induced by the rotation of the reel 37 and held by drawing rollers 40 which are positioned so as to axially withdraw the bulk yarn at a desired rate providing for an initial desired bulkiness. The yarn is then forwarded to the drying reel 41 whereon it is dried. After drying the bulk yarn is led to a collecting device 44 through the draw

rollers 42 and guide 43 where it can be collected with an additional twist or without the twist depending upon final requirements.

In the method of Figure 2 the bulked yarn is withdrawn from reel 37 by the draw rollers 40 at a rate determining its initial size, then it is led to the drying reel 41; also, it can be stretched between the dryer reel 41 the draw rollers 40 and between the dryer reel 41 and the draw rollers 42.

The reel 11 of Figure 1 and the reel 37 of Figure 2, from which the multi-filament strands 9 and 30 are drawn off to form bulk yarn, are unitary thread-storing, thread-advancing devices constructed and operating on the principle disclosed in the Knebusch Patent 2,210,914 and in the Torrence et al. Patent 2,217,717. Briefly, each reel comprises two interdigitating reel members 47, 49 each of which has a periphery of a plurality of longitudinally extending bar members. The reel member 47 is concentric and fixed to the reel shaft 48 and the second reel member 49 is mounted on a sleeve (not shown) about the reel shaft 48 whose axis is offset and askew to the shaft axis. Thus, when the reel is rotated, thread and the like is advanced in a helix over its periphery.

Being generally cylindrical in shape, the reel lets off strand turns that are nearly circular in form. Since the strand is composed of a great many filaments that are generally parallel in each yarn or strand and, since in progressing over a reel where, because of angularity between the reel members each tends to support several turns of yarn at the very end, the multi-filaments of each thread turn when let off, form a continuing, sheer, tubular skein which is further twisted into a gnarled, bulky material by the rotation of the reel. This material, after treatment and upon stretching to a desired diameter or approximate desired denier, will yield a bulky yarn that resembles and has the characteristics of wool appearing yarns. It can be formed into tying string, knitting yarn, crocheting yarn; it can also be utilized in weaving. For industrial purposes, it can be used in filters and for packing material.

The process or method described herein need not be as complete as shown in Figures 1 and 2. It can be advantageously shortened by immediately collecting the yarn onto a spool or in bulk form after the rollers 13 or 40. This shortened method limits stretching to the withdrawing period only. Bulky yarn, so collected, has to be further dried by any desired method.

What is claimed is:

1. The method of making a bulky yarn comprising, advancing a multi-filament yarn through a helix, rotating the helix, withdrawing said yarn out of said helix along the longitudinal axis of the helix so as to make a web of the yarn filaments, rotating said web to form a twisted strand thereof, and collecting said twisted strand.

2. The method of making a bulky yarn comprising, advancing a multi-filament yarn through a helix, rotating the helix, wet processing said yarn while advancing it through said helix, withdrawing said yarn out of said helix along the longitudinal axis of the helix so as to make a web of the yarn filaments, rotating said web to form a twisted strand thereof, stretching said twisted strand, and collecting said twisted strand.

3. The method of forming a yarn having bulk properties comprising, a mixed yarn supply, forming a helix of said mixed yarn, rotating said helix, wet processing said helix, withdrawing the yarn out of said helix along its longitudinal axis so as to make a web of the yarn filaments, rotating said web to form a. twisted strand thereof, setting the twist, stretching said twisted strand, and collecting said twisted strand.

4. The method of forming a bulky yarn comprising, a yarn supply, advancing said yarn through a helix, rotating said helix, wet processing said helix, withdrawing said yarn out of said helix along its longitudinal axis so as to make a web of the yarn filaments, rotating said web to form a twisted strand thereof, forcing out filaments from said web while it is being twisted into a strand, and collecting said twisted strand.

5. The method of forming a bulky yarn comprising, a supply of different multi-filament yarns, combining yarns from said supply into a single strand, forming a helix of said strand, rotating the helix, wet processing said helix, withdrawing the strand out of said helix along the longitudinal axis of the helix so as to make a web of the yarn filaments, rotating said web to form a twisted strand thereof, stretching the twisted strand, and collecting said twisted strand.

6. The method of forming bulky yarn comprising, a multi-filament yarn supply, advancing yarn from said supply through a helix, rotating said helix, wet processing said helix, withdrawing said helix along its longitudinal axis so as to make a web of said filaments, rotating said web while still wet to form a strand thereof, drying said strand, stretching said dried strand, and collecting said stretched and dried strand.

7. The method of forming a bulky yarn comprising, a multi-filament yarn supply, advancing yarn from said supply through a helix, rotating said helix, wet processing said helix, withdrawing said yarn out of said helix along its longitudinal axis so as to make a web of the yarn filaments, deforming said web, rotating said web to form a strand thereof, stretching said formed strand prior to drying, drying the strand, applying a stretch to the dried strand, and collecting said dried strand.

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