

Sept. 28, 1965

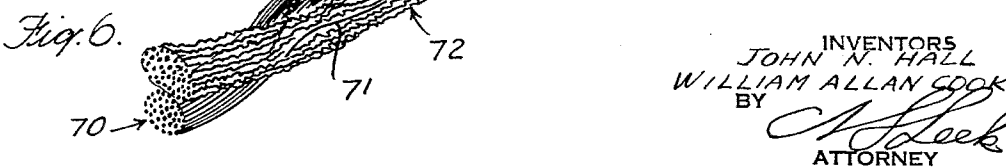
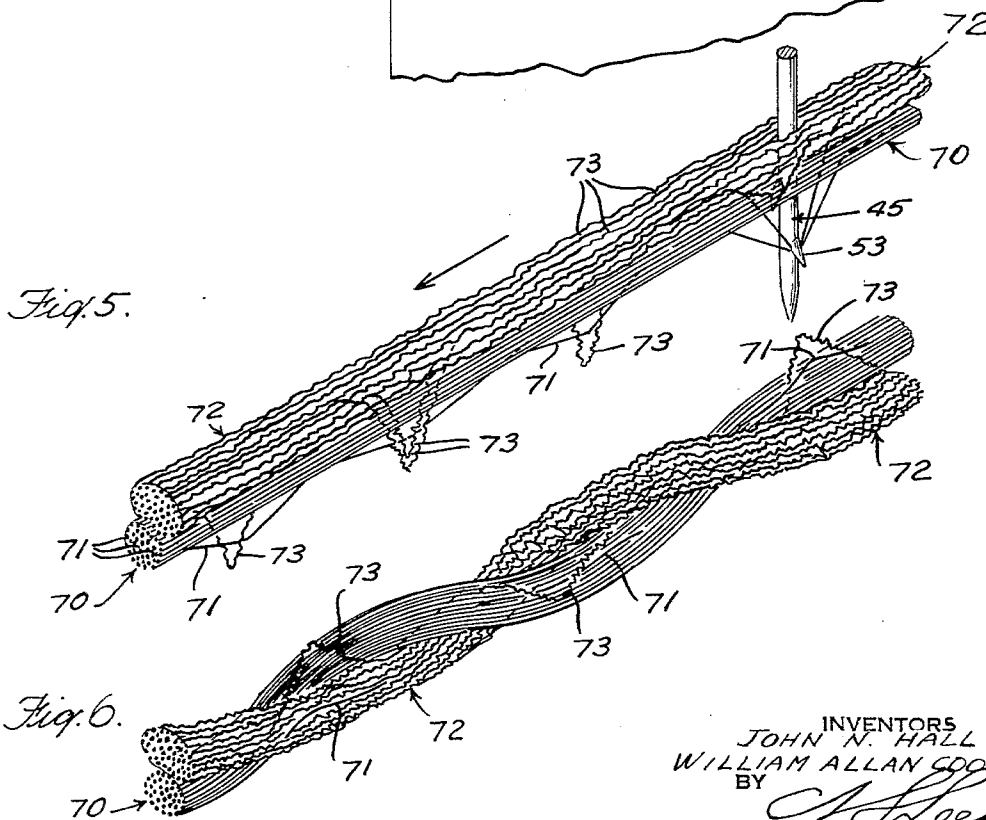
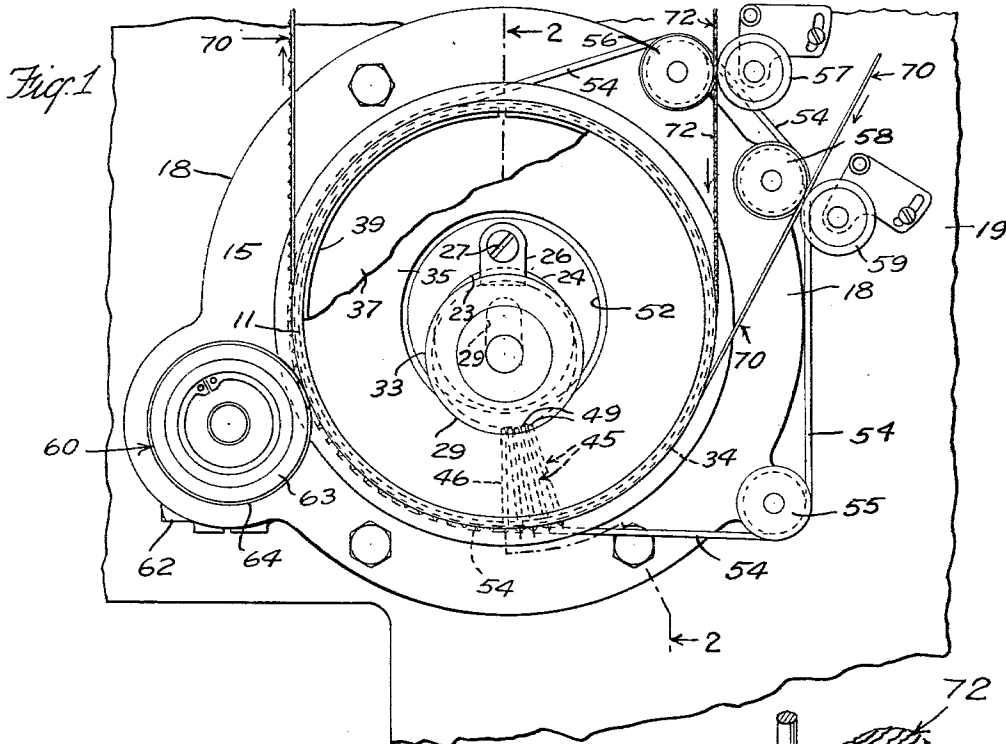
J. N. HALL ETAL

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APPARATUS FOR MAKING BULKED YARN

Filed July 17, 1963

3 Sheets-Sheet 1



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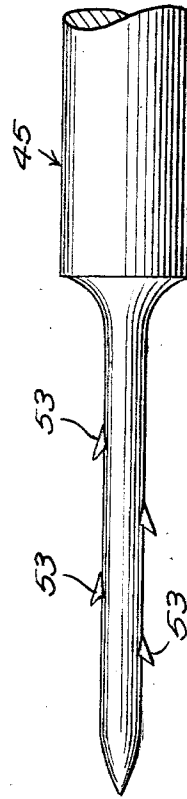
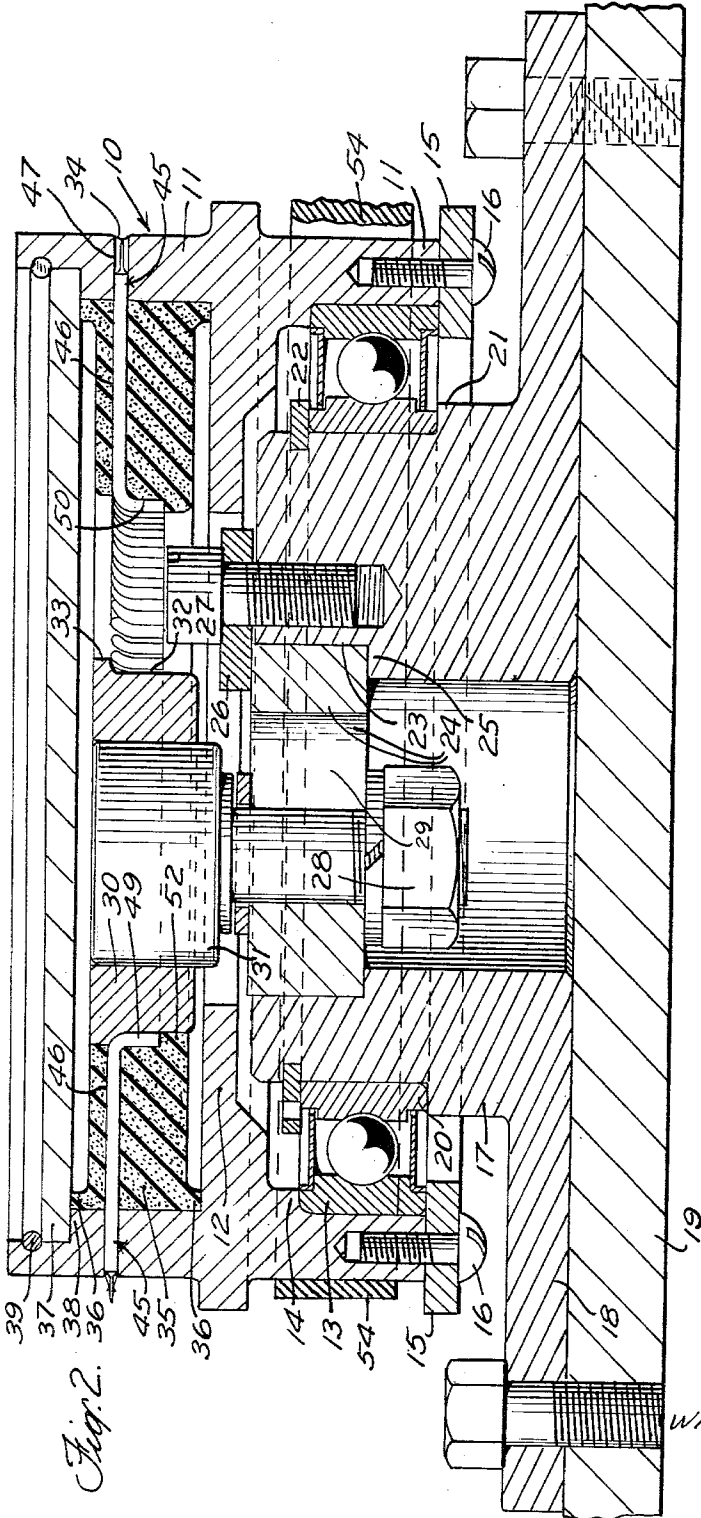
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APPARATUS FOR MAKING BULKED YARN

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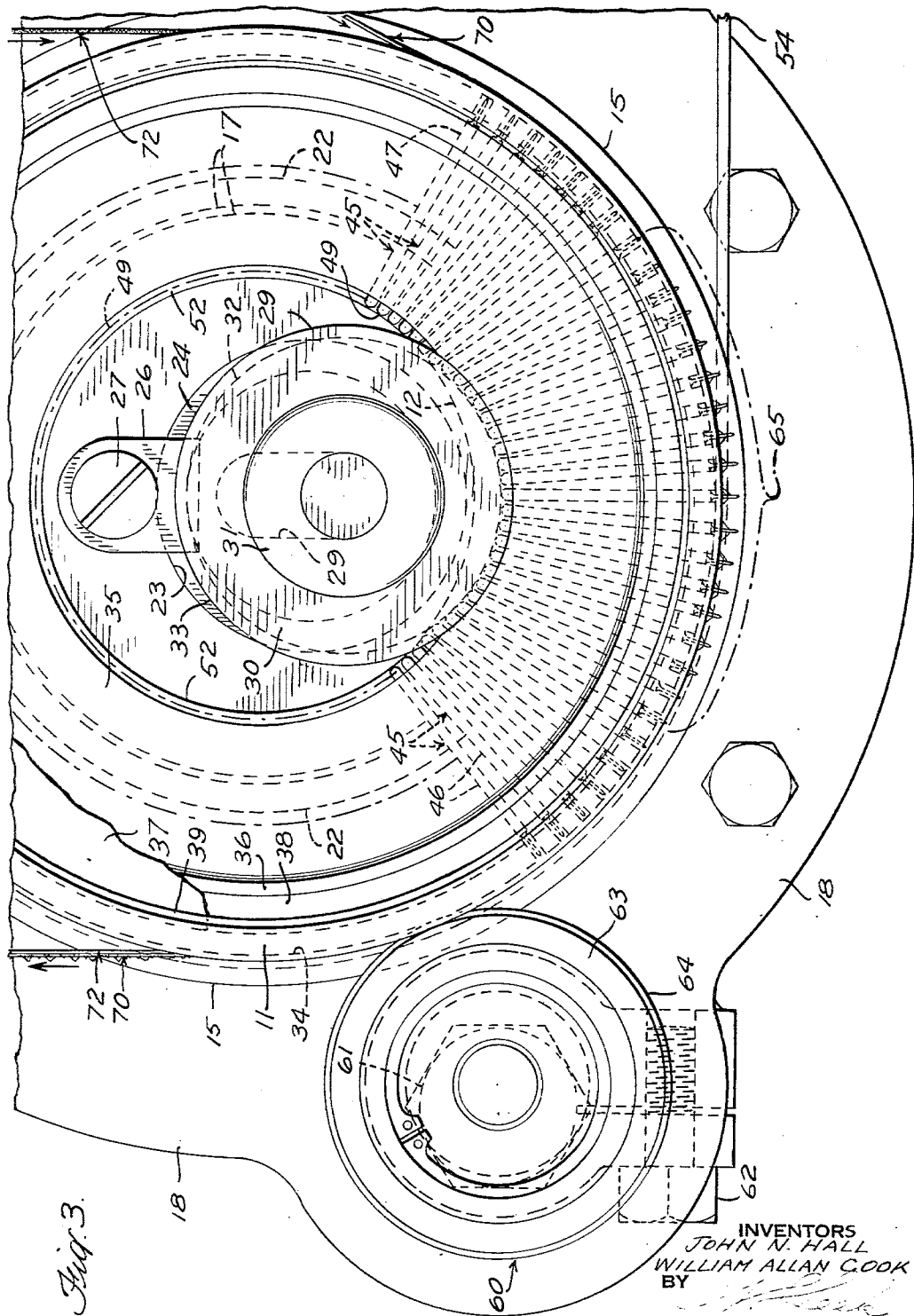
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APPARATUS FOR MAKING BULKED YARN

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APPARATUS FOR MAKING BULKED YARN

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6 Claims. (Cl. 28—4)

This invention relates to an apparatus for making bulked yarns and more particularly to an apparatus wherein filaments are entangled or intermeshed to provide a yarn having predetermined characteristics of bulk and stretch.

An object is to provide a yarn composed of a plurality of continuous filaments, at least some of which have been bulked, wherein the bulked and unbulkied filaments are held in non-slip relationship.

Another object is to provide a yarn of the above type having novel and improved characteristics.

Another object is to provide a multifilament yarn wherein the filaments are interlocked at spaced points to eliminate relative slippage.

Another object is to provide a multifilament yarn wherein certain of the filaments are broken at intervals to provide a spun yarn effect.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

In accordance with this invention one or more ends each composed of a bundle of continuous filaments are passed in superimposed relationship around a circumferential groove in a drum containing a plurality of barbed needles which are disposed radially within the drum and are adapted to be progressively extended through the bundle of filaments in the groove. The needles thus pierce the filament bundles and cause displacement or breakage of certain filaments so that interlocking of the various filaments takes place. The bundle is then twisted and set in twisted state for permanently securing the filaments in interlocked relationship.

The invention is particularly applicable to an embodiment wherein one of the ends is crimped and the other of the ends is uncrimped or is crimped to a lesser extent than the first end. When such ends are twisted together the crimped filaments tend to slip over the straight filaments and produce an irregular effect in the yarn. However, when the filaments are interlocked in accordance with this invention such slippage is eliminated and a uniform yarn is obtained.

The nature of the invention will be better understood from the following description, taken in connection with the accompanying drawings in which a specific embodiment has been set forth for purposes of illustration.

In the drawings:

FIG. 1 is a broken plan view of a needling apparatus embodying the invention;

FIG. 2 is a vertical section taken on the line 2—2 of FIG. 1 but on a larger scale;

FIG. 3 is a broken plan view similar to FIG. 1 but on a larger scale showing the needling zones;

FIG. 4 is an enlarged detail showing the barbed end of a needle;

FIG. 5 is a diagrammatic illustration showing a view of the needling apparatus; and

FIG. 6 is a similar diagrammatic view illustrating the final product.

Referring to the drawings more in detail the invention is shown as embodied in a needling apparatus comprising a rotating drum 10 having a peripheral wall 11 and a radial wall 12. The drum carries an outer ball race 13 which is held against a shoulder 14 by a ring 15 and clamping screws 16. The ring 15 extends outwardly be-

yond the periphery of the wall 11 to serve as a belt guide. The drum 10 is mounted on a fixed hub member 17 having a lower flange 18 attached to a base plate 19. An inner ball bearing race 20 is secured against a shoulder 21 on the hub member 17 by a spring locking ring 22.

The hub 17 has an eccentric recess 23 in which a disc 24 is received and is clamped against a shoulder 25 by a lug 26 which is secured to the hub 17 by a screw 27. A roller 30 is journaled to rotate on a stud 31 which is adjustably secured in a slot 29 by means of a lock nut 28. The eccentricity and the angular position of the roller 30 may be adjusted by shifting the stud 31 along the slot 29 and rotating the disc 24 in the recess 23 of the hub. The roller 30 has a cylindrical surface 32 with a curved projecting flange 33 at its upper edge for the purpose to be described.

The drum 10 is formed with a peripheral groove 34 for the filaments to be treated.

A resilient ring 35 is disposed within the peripheral wall 11 of the drum 10 and is formed with an outer bead portion 36 which rests upon the radial wall 12 and is clamped in position by a cover disc 37 resting on a shoulder 38 of the wall 11 and secured by a locking ring 39. The ring 35 is made of a soft resilient material such as natural or synthetic rubber, polyurethane or other plastic material. A plurality of needles 45 extend radially through holes 46 in the ring 35 and through aligned holes 47 in the wall 11 registering with the groove 34. The holes 46 can be replaced by radial surface grooves if desired for ease of assembly. The inner ends of the needles 45 are bent downwardly to form legs 49 resting against the inner peripheral surface 50 of the ring 35. The lower ends of the legs 49 terminate above and adjacent the upper surface of an inner peripheral flange 52 of the ring 35. The cylindrical surface 32 of the roller 30 is adapted to engage the inner surface of the legs 49 of the needles 45 and the inner peripheral surface of the ring flange 52. The top flange 33 of the roller conforms to the curve of the legs 49 to prevent axial movement of the legs when the ring 35 is compressed by the roller 30. When the drum rotates around the hub 17 the legs 49 are engaged and displaced by the cam roller 30 to cause the needles 45 to project through the holes 47 in the wall 11 and into the groove 34.

The projecting ends of the needles 45 are of reduced diameter and carry barbs 53 which are adapted to engage and displace or in some cases to break the filaments in the groove 34. The drum 10 is driven by a belt 54 from a driving roll 55.

A bundle 72 of crimped continuous filaments 73 is passed between a driven feed roll 56 and an adjustable rubber surfaced feed roll 57 into the groove 34 of the drum 10. A second bundle 70 of straight or uncrimped filaments 71 or of less highly crimped filaments, is fed between a driven feed roll 58 and an adjustable rubber surfaced feed roll 59 to overlie the first bundle in the groove 34. The rolls 56 and 58 are driven by the belt 54.

A clamping roller 60 is eccentrically journaled on a stud 61 secured in the flange 18 by clamping bolt 62. The roller 60 has a resilient rim 63 of compressible material such as natural or synthetic rubber having a peripheral bead 64 positioned to contact the filaments in the groove 34 to hold them under tension in their passage through the piercing zone 65 where the needles 45 are in advanced position.

As the drum 10 with the bundles of filaments rotates about the hub 17 of the cam, roller 30 engages and progressively advances the needles 45 to cause the barbed ends to project through the holes 47 in the wall 11 so that the barbs 53 engage and displace some of the filaments in the bundles as shown in FIG. 5. When the needles again retract the straight yarn 71 tends to snap back

into place in the groove 34 while the crimped filaments 73 tend to remain displaced and entangled with the filaments 71. The entanglement is such that slippage of the crimped filaments on the straight filaments is prevented or reduced. If the filaments 71 are slightly crimped instead of being straight the entanglement provides a bond which locks the various filaments in place.

While two filament bundles have been shown as fed to the groove 34 for entanglement by the needles, 45, obviously a single multifilament bundle may be so treated or in certain instances the barbs may be caused to break certain of the filaments in the bundle to produce a yarn having the appearance of a spun yarn.

After leaving the drum 10 the bundles may be twisted together as indicated in FIG. 6 to provide a bulked yarn which can be fed through a tension device or packaged without displacement of the filaments. If desired the yarns can be heat set for permanence.

The bulked yarn may be over fed into the entangling zone together with an unbulkied yarn which is fed at a normal rate and with which the bulked yarn is to be entangled. It is to be understood of course that other combinations of yarns may be treated in this apparatus. For example, a plurality of unbulkied yarns, or a plurality of bulked yarns, or a mixture of the two may be fed to the entangling zone at different rates, or in some cases a yarn having variations in bulk along its length may be combined with an unbulkied core yarn to be entangled therewith as the yarn passes around the drum.

The yarns in the combination above need not be of the same chemical composition or fiber form. Continuous filament synthetic fibers, staple synthetic fibers, cotton, wool, glass fibers, etc. can be used.

An overfed thick and thin yarn having variable bulk may be entangled with an unbulkied core yarn to produce a non-stretch thick and thin yarn.

The yarns in the various combinations may have equal or different shrinkage potentials.

The individual yarns in a combination of yarns may be fed at equal rates or the rate of feed may be changed so as to overfeed an individual yarn relative to the remaining yarns in the combination.

The following are specific examples:

(A) An overfed bulked yarn may be entangled with an unbulkied yarn to produce a non-stretch bulked yarn.

(B) Two unbulkied yarns may be fed at an equal rate to the entangling zone to produce a blended yarn which will resist strip back.

While the invention has been shown as applied to an embodiment comprising a pair of filament bundles it is to be understood that a plurality of bundles can be com-

bined and that the filaments of the various bundles may or may not be of the same material.

What is claimed is:

1. Apparatus for making a bulked yarn composed of a plurality of filaments which comprises a rotatable drum having a peripheral yarn receiving groove, a plurality of radially disposed needles within said drum in registration with said groove, cam means progressively advancing said needles into said groove for displacing filaments therein, and means feeding a bundle of filaments into said groove for engagement and displacement by said needles.

2. Apparatus as set forth in claim 1 in which a resilient ring is disposed within said drum and said needles are carried by said ring.

3. Apparatus as set forth in claim 1 in which said needles are formed with axially extending legs within said drum and a cam roller is disposed to progressively engage said legs for advancing said needles into said groove.

4. Apparatus as set forth in claim 3 in which said needles are carried in a ring of resilient material and said cam roller is adapted to engage said needle legs and said ring.

5. Apparatus for treating textile materials composed of a plurality of filaments which comprises a rotatable member having a peripheral surface adapted to receive said filaments, means feeding said filaments along said surface, a plurality of filament-displacing needles disposed along said surface, and means advancing said needles in sequence through said surface in a direction to cause entanglement of said filaments in the zones of displacement whereby the filaments are entangled to prevent relative longitudinal displacement thereof.

6. Apparatus as set forth in claim 5 in which said displacing needles having barbs disposed to be advanced to engage said filaments in said groove.

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