United States Patent

Eschenbach

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[54] **NOVEL YARN PACKAGE AND APPARATUS FOR PRODUCING SAME**

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[52] **U.S. Cl.** **242/47,** 28/21, 57/66, 242/82, 242/83, 242/159

[51] **Int. Cl.** **B65h 51/00,** B65h 57/00

[58] **Field of Search**.....242/47, 47.1, 82, 83, 159; 28/21; 57/66

[56] **References Cited**

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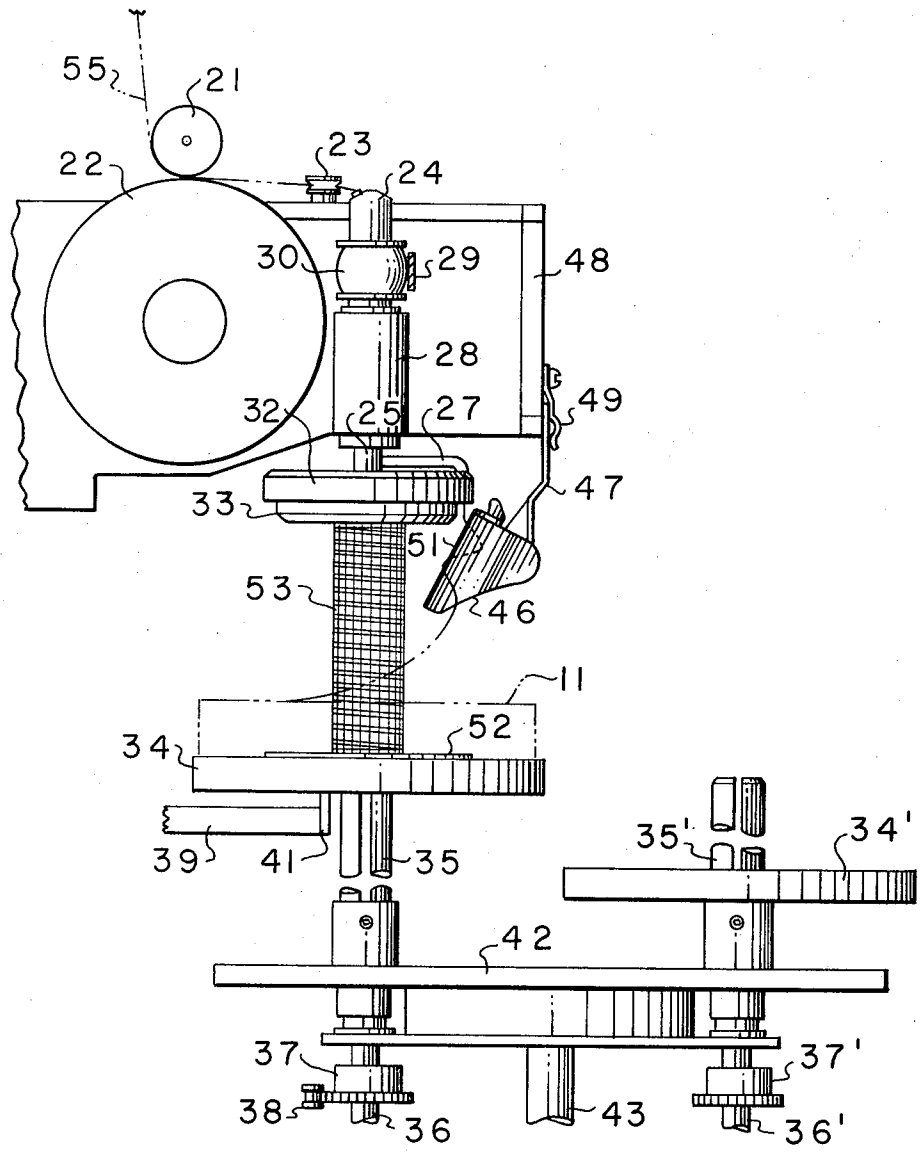
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[57] **ABSTRACT**

A yarn package with a high degree of uniformity in the yarn density throughout the package comprising an ascending series of generally heart shaped yarn loops disposed around a central core with a portion of each loop adjacent the core being disposed in a generally reflex angle configuration and the apex of the angle adjacent the core and another portion of each loop being adjacent the periphery of the package. Also, a novel method and apparatus for producing such a package.

3 Claims, 3 Drawing Figures



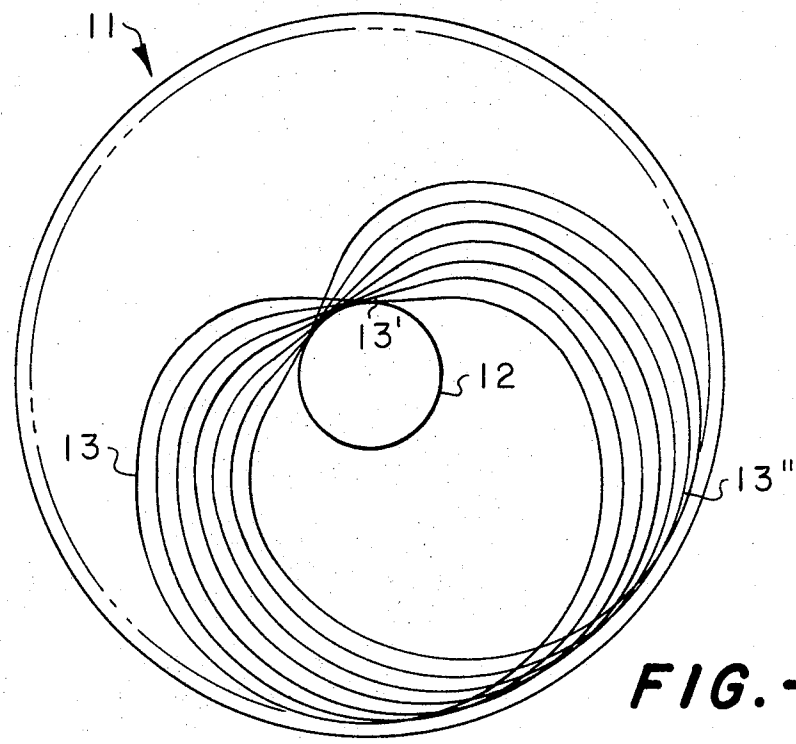


FIG. -1-

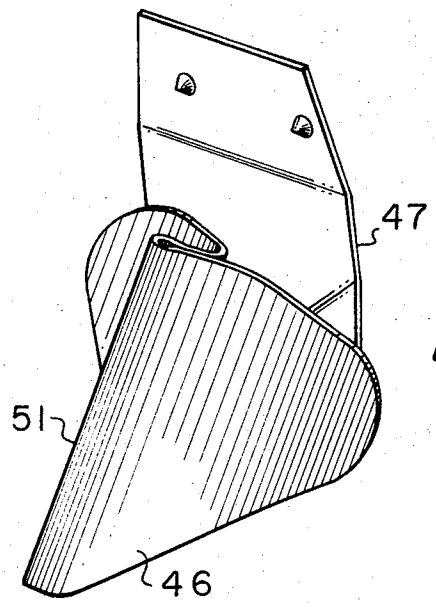


FIG. -3-

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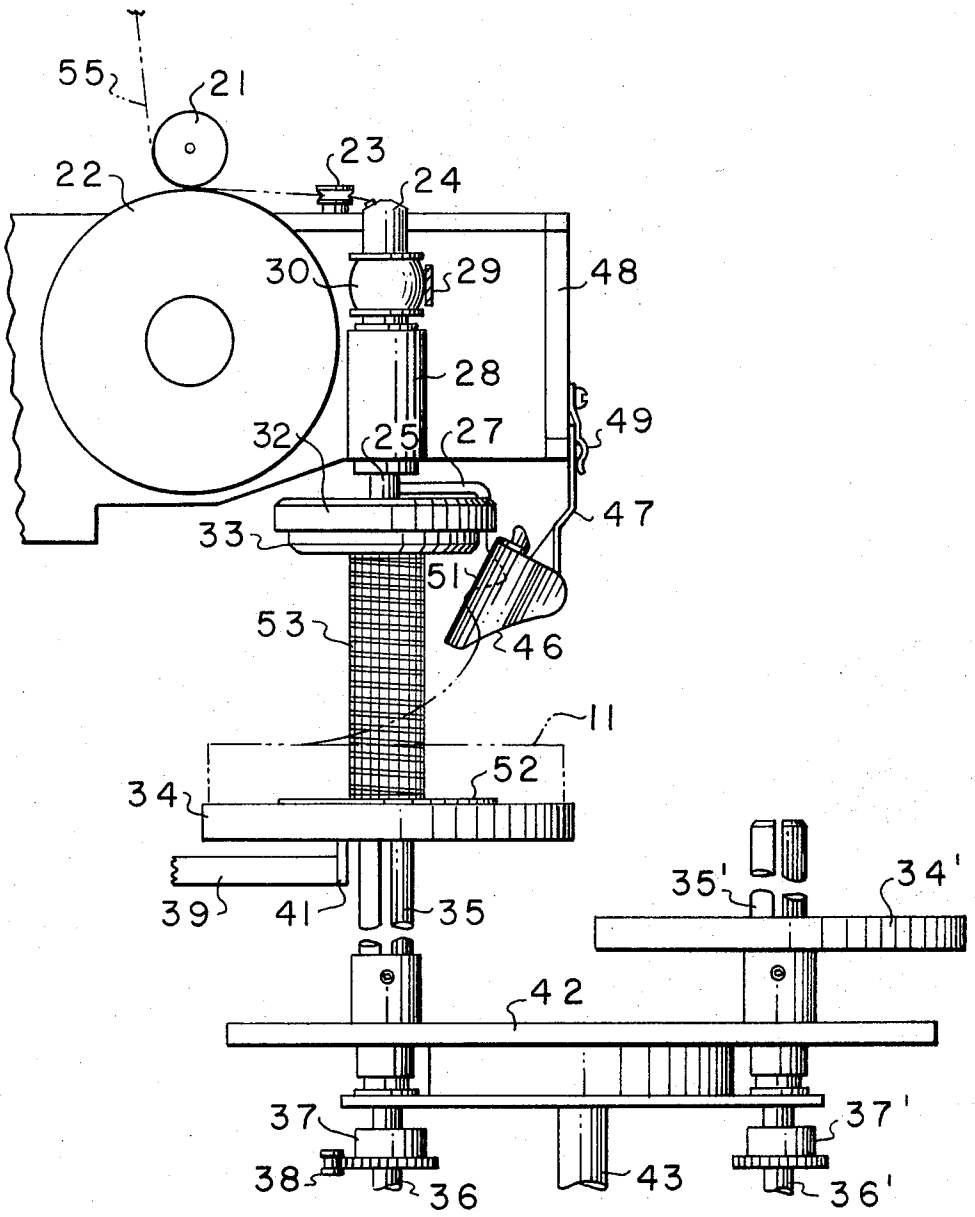


FIG.-2-

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NOVEL YARN PACKAGE AND APPARATUS FOR PRODUCING SAME

This invention relates to a novel yarn package having a high degree of uniformity in the yarn density throughout the package. Also, the invention relates to a new method and apparatus for winding yarn in a pattern to achieve such improvement in density uniformity.

It has been proposed to bulk yarn in package form instead of by the conventional method which involves skein treatment. To achieve a high degree of bulking a yarn package generally will possess certain characteristics. For example, the yarn pattern should permit the yarn to contract without tightening on itself. Also, the density of the package will be low to allow space for yarn movement during the bulking step. In addition, the pattern should permit easy and efficient winding of the package and backwinding after bulking at acceptable production rates.

One winding pattern producing packages which can be bulked successfully involves the looping of the yarn around a central core to provide an ascending series of yarn loops with a portion of each loop adjacent the core and another portion of each loop adjacent the periphery of the package. In general, this is accomplished by locating a yarn distributing means offset from the axis of the core and rotating the distributing means at a substantially higher rpm than the rotation of the turntable.

Although the resulting yarn package can be treated to achieve a high degree of bulking, unless the yarn density throughout the package is substantially uniform, subsequent dyeing of the package may produce color variations along the length of the yarn. This results in rejects and seconds which can make the process uneconomical.

The present invention provides a novel yarn package with a high degree of uniformity in the yarn density throughout the package. Also, the invention provides a simple and convenient method and apparatus for winding such a package. Furthermore, existing winding equipment can be easily converted to produce such a uniform density package.

The yarn package of the present invention comprises an ascending series of generally heart shaped yarn loops disposed around a central core with a portion of each loop adjacent the core disposed in a generally reflex angle configuration with the apex of the angle being adjacent the core and another portion of each loop adjacent the periphery of the package. Such yarn packages exhibit improved uniformity in yarn density throughout the package from the central core to the periphery thereof. This high degree of density uniformity is present both in the package as originally wound and after bulking in package form. Also, when such yarn packages are dyed, the yarn is uniform in depth of color along its length. Particularly useful yarns are heat shrinkable acrylic and polyester yarns.

Other advantages of the invention will be apparent from the following description and the accompanying drawings in which:

FIG. 1 is a schematic illustration of the pattern of a yarn package of the invention showing an ascending series of heart shaped yarn loops;

FIG. 2 is a schematic elevation of one form of winding apparatus of the invention, and

FIG. 3 is an enlarged perspective view of the yarn deflector of the apparatus shown in FIG. 2.

As shown in FIG. 1, a yarn package 11 has a central core 12 and a plurality of overlapping heart shaped yarn loops or coils 13. Each complete yarn loop 13 has a portion thereof 13' adjacent the central core and another portion of the loop 13'' adjacent the periphery of the package. In FIG. 1, portion 13' is in contact with the core 12 at a single point along its length, that is, at the apex of a reflex angle formed by the yarn as it moves into contact with and away from the core. Thus, the point of contact between the yarn and the core is at the indentation between the adjacent portions of the loop which form the outwardly extending upper curved portions of the heart shaped loop.

Apparatus for forming the uniform density package with the heart shaped coil pattern as shown in FIGS. 2 and 3 includes feed rolls 21 and 22, with roll 22 being driven by a motor (not shown) and roll 21 being movable toward and away from roll 22. Adjacent the rolls is a guide 23 and aspirator 24 which has an air passage therethrough joining a shaft 25. At the lower end of shaft 25 is a whorl tube 27. Shaft 25 is mounted for rotation in support 28. The whorl tube 27 and shaft 25 are rotated by a belt 29 driving a pulley 30 which is affixed to the upper portion of the shaft 25 adjacent the aspirator 24. Belt 29 is driven by suitable drive means (not shown).

Shaft 25 extends from the whorl tube 27 and to this extension is affixed a plate 32. The delivery portion of whorl tube 27 is positioned to extend through a portion of plate 32 adjacent the periphery thereof. Independently journalled below plate 32 is a reference base 33.

A yarn package turntable 34 is located in a position spaced from the whorl assembly with the axis of the turntable offset with respect to the axis of the whorl assembly. The turntable is carried by a slotted spindle 35 with the turntable engaging the slots thereof and movable longitudinally along the spindle. To the lower portion of spindle 35 is affixed a drive shaft 36 driven by a sprocket 37 which engages a chain 38. Chain 38 is driven through a suitable power source (not shown).

Movement of turntable 34 along spindle 35 is effected through a bracket 39 having a crescent shaped extension 41 which bears against the turntable. Bracket 39 is controlled by a suitable double acting cylinder (not shown). Turntable 34 is mounted near one end of a rotatable arm 42 which is pivotable on a shaft 43. Adjacent the opposite end of arm 42 is disposed a second turntable assembly with a similar arrangement of turntable 34', spindle 35', shaft 36' and driven sprocket 37'. This construction provides for positioning of one turnable under the whorl tube for the formation of a yarn package and the subsequent pivoting of this turntable to a position remote from the whorl after the package is completed and the location of the second turntable under the whorl for the formation of another yarn package.

To form the novel yarn package of the present invention with its heart shaped coil pattern, the yarn is changed from its normal circular path. This is accomplished with the apparatus shown in the drawings by positioning a deflecting surface 46 in the path of the yarn below the end of the whorl tube 27. Deflector 46 is maintained in its desired position by a bracket 47 which is secured to supporting member 48 with a spring clip 49.

The yarn deflector 46 has an edge surface 51 which is positioned across the normal yarn path. Edge 51 generally is several inches long to allow for movement of the yarn as it advances to the turntable. Advantageously, the deflector has a plow shape which provides rigidity of the edge surface 51 and wing portions to provide a smooth flow of air around the moving yarn. Mounting of the deflector 46 through bracket 47 and support 48 allows clearance for the rotation of the whorl assembly and the rotation and raising and lowering of the turntable assembly. Also the attachment of deflector 46 through spring clip 49 permits the deflector to be removed easily for maintenance of the apparatus and also for the substitution of a deflector with a different angle or shape to the edge surface thereof.

In the operation of the apparatus shown in the drawings to form the novel yarn package of the present invention having a high degree of uniformity in the yarn density throughout the package, a package base 52 having spring core 53 is positioned on turntable 34. Yarn 55 from a package (not shown) is drawn between rolls 21 and 22, past guide 23 into aspirator 24. The yarn is forced through shaft 25 by air moving through the shaft. The yarn moving through the shaft is delivered from the end of whorl tube 27 which is rotated by belt 29 in contact with pulley 30. The whorl tube is rotated at a much higher rpm than the rotation of turntable 34. The yarn from whorl tube 27 is deflected by edge 51 of deflector 46 and passes downwardly around spring core 53 accumulating in an ascending series of

overlapping heart shaped loops with a portion of each loop adjacent the core and another portion of each loop adjacent the periphery of the package.

To provide a yarn package with a uniform loop pattern, it is advantageous to maintain the spacing substantially constant between the end of whorl tube **27** and the deposition point of the yarn loops. This may be achieved in accordance with the apparatus of the invention by raising the turntable **34**, prior to the beginning of the winding cycle, to a position close to the whorl assembly with the spring core **53** in contact with and compressed against reference base **33**. This contact stops base **33**, which normally rotates with plate **32**. As yarn accumulates on the package base **52**, turntable **34** is moved away from the whorl tube by lowering bracket **39** at a rate sufficient to maintain a substantially constant distance between the end of the whorl tube **27** and the plane in which the yarn loops are being deposited. During the formation of the yarn package, another package base is positioned on turntable **34'** and upon completion of the winding of the first package, arm **42** is rotated so that turntable **34** moves from below whorl tube **27** and is replaced by turntable **34'** which rotates into winding position under the whorl tube. The completed package is then doffed from the turntable **34** and a new package base positioned on the turntable for subsequent winding. The wound packages can be bulked and/or dyed and other processes performed thereon with a high degree of uniformity along the length of the yarn in the packages.

The above description and drawings show that the present invention provides a novel yarn package having a high degree of uniformity in the yarn density throughout the package. Moreover, the yarn package has improved structural stability which simplifies handling. Furthermore, uniformity of dyeing can be achieved with the package of the invention. The novel method and apparatus of the present invention provide a simple and convenient means for winding such a yarn package. In addition, the design of the apparatus simplifies the donning and doffing of such a package.

It will be apparent that various modifications and changes can be made in the particular embodiments described herein and shown in the drawings within the scope of the invention. For example, the shape and placement of the yarn deflecting surface may be of a different design. Therefore, it is intended that the invention be limited only by the following claims.

That which is claimed is:

1. A yarn package with a high degree of uniformity in the yarn density throughout the package comprising an ascending series of generally heart shaped yarn loops disposed around a central core with a portion of each loop adjacent the core being disposed in a generally reflex angle configuration and the apex of the angle adjacent the core and another portion of each loop being adjacent the periphery of the package.

2. A yarn package according to claim **1** wherein the yarn is a heat shrinkable acrylic yarn.

3. A yarn package according to claim **1** wherein the yarn is a heat shrinkable polyester yarn.

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