

[54] **STRAND GUIDE APPARATUS**
[75] Inventor: **David V. Stotler**, Newark, Ohio
[73] Assignee: **Owens-Corning Fiberglas Corporation**, Toledo, Ohio
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[51] Int. Cl. **B65h 55/00**
[58] Field of Search **242/129, 129.5-129.8, 242/128, 170, 171, 137.1**

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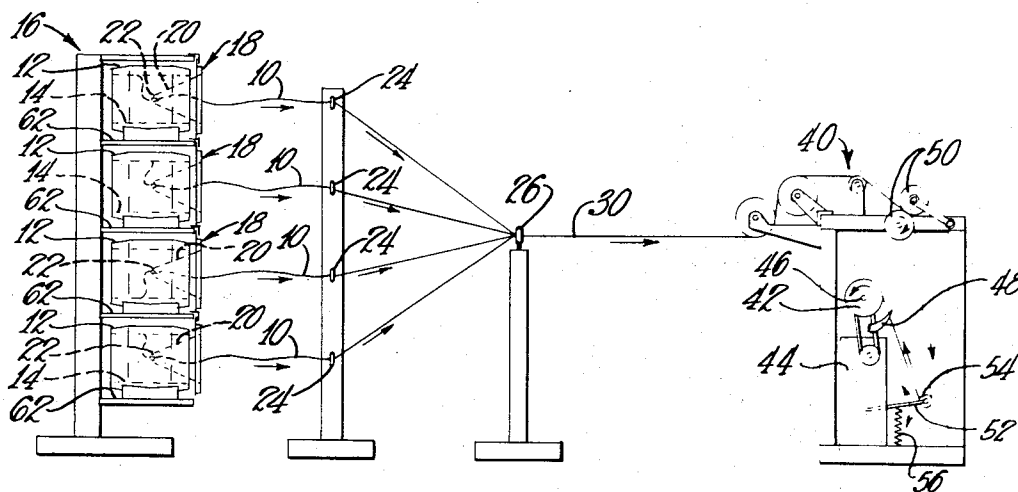
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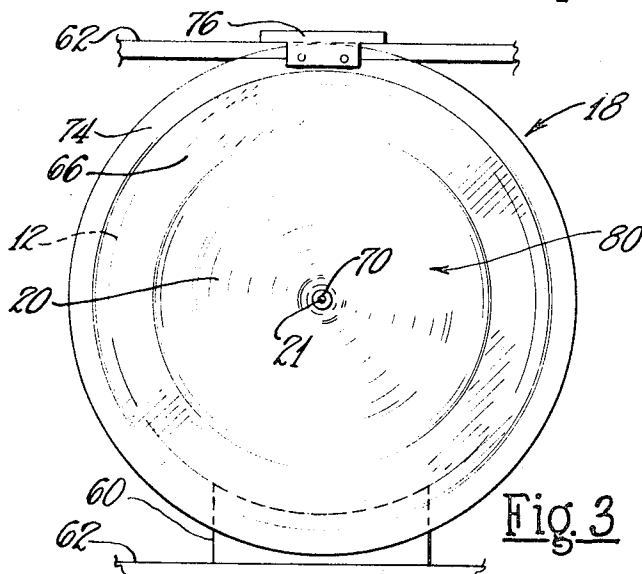
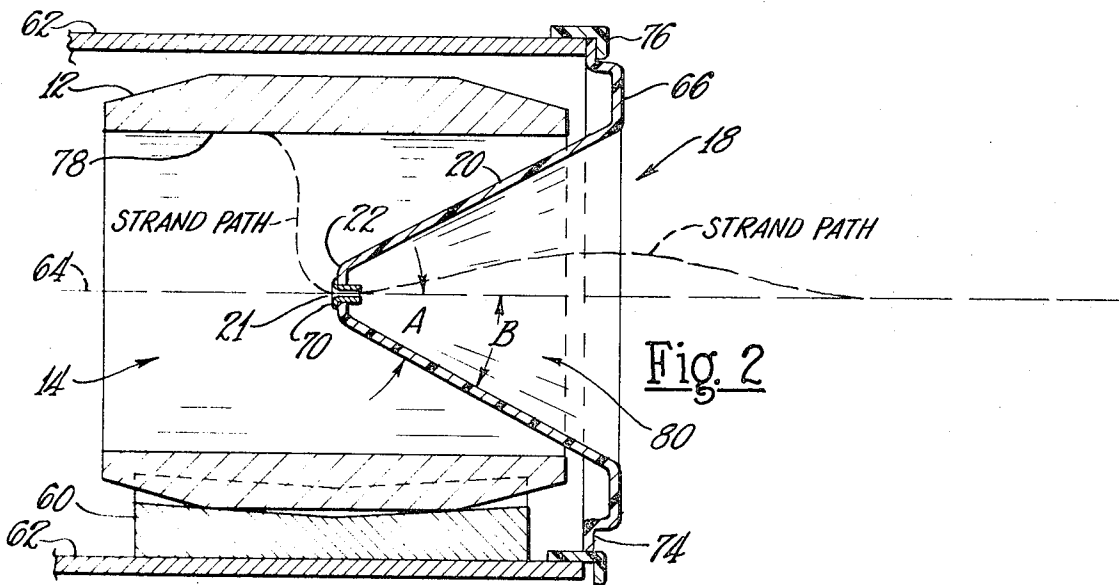
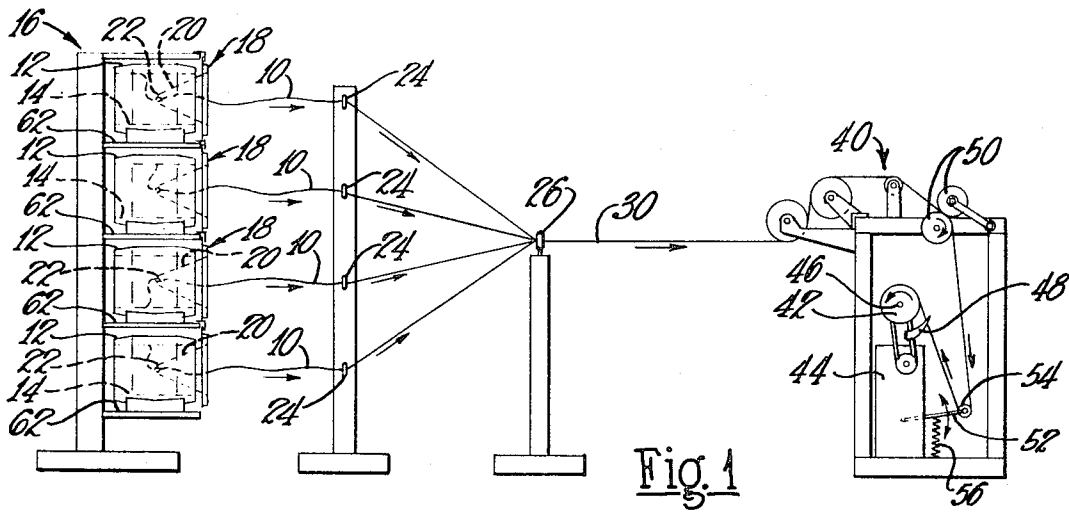
Primary Examiner—Leonard D. Christian
Attorney—Carl G. Staclin et al.

[57] **ABSTRACT**

Apparatus for withdrawing strand from a wound package having a hollow central region from which strand can be withdrawn including a strand guide having an opening through which strand leaving the package can travel, in which a support for locating the strand guide with its opening interiorly of the package and means for withdrawing strand from the interior of the package through the opening is provided.

10 Claims, 7 Drawing Figures





INVENTOR.
DAVID V. STOTLER
BY

Staelin & Overman
ATTORNEYS

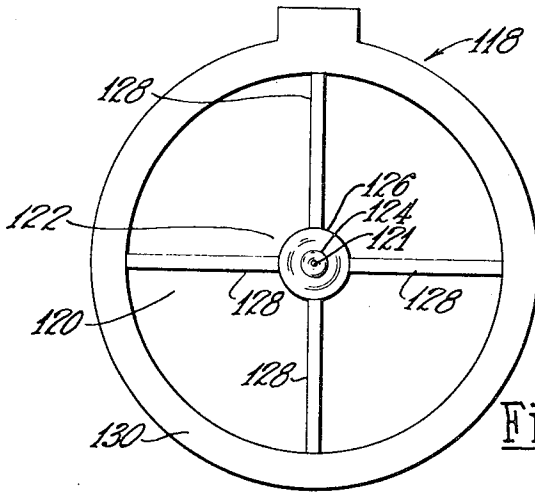


Fig. 5

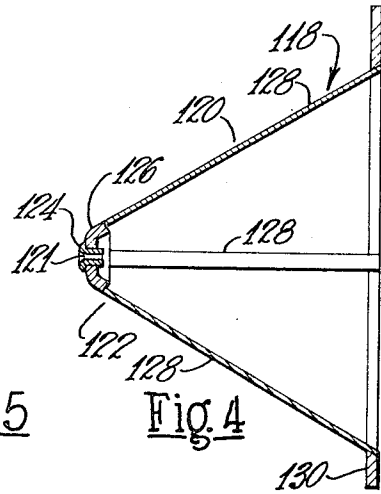


Fig. 4

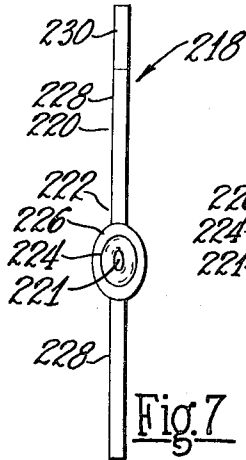


Fig. 7

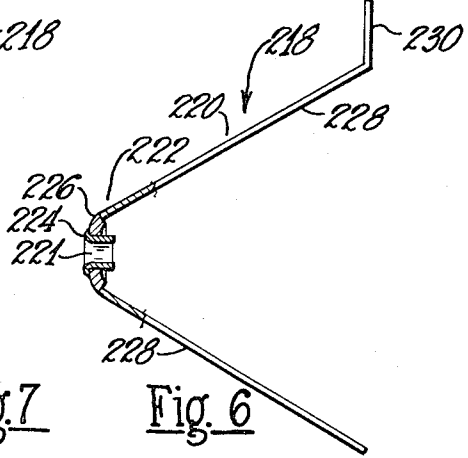


Fig. 6

INVENTOR.
DAVID V. STOTLER

BY

Staelin & Overman
ATTORNEYS

STRAND GUIDE APPARATUS

BACKGROUND OF THE INVENTION

The demand for increased textile processing speeds often challenges prior apparatus and methods beyond their capabilities. For example, simply removing strand or yarn from the interior of a package ("inside take-off") can at higher strand speeds cause considerable difficulty. At faster strand speeds a strand leaving its package from one end tends to balloon uncontrollably outwardly of the package. In multiple package processes such as roving and beaming operations uncontrolled ballooning is especially bothersome. The outwardly ballooning strands often tangle with each other causing strand breakouts. Also, the speeding strands balloon outwardly to tangle with surrounding apparatus such as strand tensioning devices and strand guides.

Hence, in a very real sense, mere "inside take-off" withdrawal of strands from their packages by prior techniques can be a barrier to increased processing speeds.

SUMMARY OF THE INVENTION

An object of the invention is improved apparatus for and method of withdrawing strand from a wound package.

Another object of the invention is improved apparatus for and method of withdrawing strand from the interior of a wound package having a hollow central region.

Yet another object of the invention is improved apparatus for and method of withdrawing strand from the interior of a wound package at higher strand speeds.

These and other objects are obtained by apparatus for withdrawing strand from a wound package having a hollow central region including a strand guide surface defining an opening and support means extending from outside the package for locating the opening interiorly of the package. Withdrawal means advances strand from interiorly of the package through the opening. Hence the strand travels from the interior surface of the package and away from the package through the guide opening located interiorly of the package.

Other objects and advantages will become apparent as the invention is described hereinafter in more detail with reference made to the accompanying drawings.

SHORT DESCRIPTION OF THE DRAWINGS

FIG. 1 is a simplified side elevation view of roving apparatus operating according to the principles of the invention.

FIG. 2 is an enlarged side elevation view in cross section of one of the strand guides and packages shown in FIG. 1.

FIG. 3 is an enlarged front elevation view of the guide and package shown in FIG. 2.

FIG. 4 is a side elevation view of another strand guide according to the principles of the invention.

FIG. 5 is a front elevation view of the strand guide shown in FIG. 4.

FIG. 6 is a side elevation view of another strand guide according to the principles of the invention.

FIG. 7 is a front elevation view of the strand guide shown in FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

While the apparatus for and method of the invention

are especially useful in processing untwisted multifilament linear textile elements such as continuous or discontinuous filament glass strand, the invention can find advantageous use in processing twisted multifilament linear textile elements such as glass yarn. One can process multifilament textile elements of organic filaments, such as nylon, rayon, polyester, and the like. Additionally, the invention is useful in processing composite multifilament linear elements, such as elements including both glass fibers and other fibers. Hence, the term strand as used in the specification and claims includes any bundle of filaments, continuous or discontinuous, that either has twist or does not have twist. The term includes textured and untextured bundles of filaments.

FIG. 1 illustrates apparatus according to the principles of the invention in a glass roving operation. The apparatus withdraws continuous glass filament strands from the inside of wound serving packages having hollow central regions.

As shown, individual glass strands 10 travel from one end of individual serving packages 12 that have axial passageways or hollow central regions 14 extending therethrough. The packages 12 are held in a creel 16. Each of the strands 10 travels through a strand withdrawal guide 18 that includes a hollow tapered portion 20 having an opening 21 at its smaller end 22. The creel mounting for the strand withdrawal guide 18 positions the guide with the smaller end 22 and opening 21 of the hollow tapered portion 20 in the passageway 14. From the guides 18 the strands 10 advance through separate external strand guides 24 spaced from the creel 16. A guide 26 beyond the individual guides 24 combines the individual strands 10 into a roving 30.

A commercially available take-up machine 40 is shown collecting the roving 30 into a wound package 42. The machine 40 includes a variable speed drive 44 for rotating a package collecting spool 46, a strand traversing guide 48, a pair of constant speed feed rolls 50 and a pivotally mounted speed control arm 52 and pulley 54 rotatably mounted on the arm 52. The roving 30 advances between the driven rolls 50 downwardly to the pulley 54 on the end of the pivotally mounted speed control arm 52 and upwardly to collect on the driven spool 46. The strand traversing guide 48 engages the roving 30 to reciprocate it lengthwise of the collecting spool 46 during collection of the roving.

The take-up machine 40 is responsive to tension in the advancing roving 30. The rolls 50 advance the roving 30 to the collecting spool 46 via the speed control arm 52 and pulley 54. The arm 52, through electro-mechanical devices within the variable speed drive 44, controls the rotational speed of the spool 46 to keep a substantially constant tension in the traveling roving 30. A spring 56 introduces a selected tension to the roving 30 between the driven rolls and the collecting spool 46.

FIGS. 2 and 3 more clearly show one of the strand withdrawal guides 18 and the relationship between the guides 18 and their supply packages 12 as generally illustrated in FIG. 1.

As shown the package 12 rests in a cradle 60 on a horizontal support or shelf 62 of the creel 16. Hence, the package 12 has its longitudinal axis horizontally disposed; the dashed line denoted by the reference numeral 64 indicates the horizontal axis of the package 12.

The strand withdrawal guide 18 includes the hollow tapered portion 20 and a flange 66 at the larger end of the hollow tapered portion 20.

The hollow tapered portion 20 as shown is generally a hollow cone with the strand entrance opening 21 at its smaller end 22. In the arrangement of FIGS. 1 through 3, the opening 21 is on the axis of the guide 18. The smaller end 22 flares outwardly away from the opening 21 in all directions obliquely of the axis 64 of the package 12 towards the strand exit end of the package 12. Hence, the opening 21 is at an externally convex surface.

A ceramic insert 70 at the smaller end provides a guide surface defining the opening 21. In practice a ceramic guide like insert 70 is used with glass strand and roving to reduce abrasion damage to the glass filaments.

The flange 66 extends laterally from the base or larger end of the hollow tapered portion 20; the flange 66 is shown normal to the axis of the guide 18. The flange 66 includes a lip 74 at its outer circumferential region that curves gently towards the smaller end 22 of the tapered portion 20 for a short distance and turns again to extend outwardly of the tapered portion 20. The flange 66 contains any tendency of a withdrawing strand to balloon from the exit end of a serving package.

A bracket 76 joins the guide 18 with the creel 16 to position the guide 18.

The strand withdrawal guide 18 is a one piece guide as shown; normally the guide 18 is a molded plastic article. In practice good results have been obtained by molding the guide 18 from plastics such as methyl acrylate (plexiglas) and vinyl. The guide 18 is often transparent.

The guide 18 is mounted for close association at one end of the package 12 and for positioning the smaller end 22 (opening 21) of the hollow tapered portion 20 in the passageway 14. As shown the axis of the guide 18 is coincident with the axis of the package 12. Moreover, the opening 21 is at the mid-length of the passageway 14.

The best strand withdrawal results occur with the guide 18 positioned with the opening 21 at the central region of the passageway 14; preferably the opening 21 is on the axis of the package 12 and at the mid-length of the passageway 14. However, one can move the guide 18 to locate the opening 21 nearer the exit end of the package 12. Also, the length of the hollow tapered portion 20 may be proportioned with respect to the length of the serving package to place the opening 21 nearer the other end of the passageway 14. Preferably the opening 21 is substantially on the axis of the package 12.

The reducing cross section of the hollow tapered portion 20 provides a surface along which a strand temporarily engaging the portion 20 can slip towards the opening 21 during strand withdrawal. The outside angle of taper for the tapered portion 20 can vary; this angle is shown as angle "A" in FIG. 2. In practice, an angle "A" of from 25 to 35° has given excellent strand withdrawal results. The inside angle of taper can vary; this angle is shown as "B" in FIG. 2.

In practice angle "B" is normally equal to angle "A". But angle "B" can be different from angle "A".

In operation the strand 10 leaves the interior surface 78 of the package 12 and advances through the guide

surface defining the opening 21 and thence towards the exit end of the package 12. Because the strand unwinds from the interior of the package 12, the strand continuously leaves the package from different locations on the interior surface 78 around the axis 64. Hence, the strand 10 tends to balloon outwardly within the passageway, the ballooning tends to become smaller as the strand 10 approaches the opening 21. The strand tends to balloon only slightly in the diverging exit passageway 80 of the hollow portion 20 as the strand travels outwardly towards one of the exterior strand guides 24. The dashed line in FIG. 2 indicates a general strand path during withdrawal.

FIGS. 4 and 5 show another strand withdrawal guide 118 for use like guide 18.

Guide 118 includes a tapered portion 120 with an opening 121 at its smaller end 122. A ceramic insert 124 in a shaped piece 126 provides a guide surface defining the opening 121. Wires 128 connect the shaped piece 126 and an annular guide base 130. The wires 128 diverge from the piece 126 to the base 130 to form a discontinuous tapered surface to the tapered portion 120.

The guide 118 is used like the guide 18 as shown in FIGS. 1 through 3.

FIGS. 6 and 7 show another strand withdrawal guide 218; the guide includes a tapered portion 220 with an opening 221 at the smaller end 222 of the tapered portion 220. An insert 224 in a member 226 provides a guide surface defining an oval opening 221.

Wires 228 extend from the ring 224 along diverging paths. One of the wires 228 is bent to have an outwardly extending portion 230 for use in joining the guide 218 with a creel like creel 16 shown in FIG. 1.

The guide is used like the guide 18 as shown in FIGS. 1 through 3.

I claim:

1. Apparatus for withdrawing strand from a wound package having a hollow central region from which strand can be withdrawn comprising:

a strand guide surface defining an opening through which strand can travel as it leaves the package; tapered support means extending from the outside of the package with diminishing size to hold the opening generally along its axis within the hollow central region of the package without obstructing strand travel through the opening; and means for withdrawing strand from the interior of the package through the opening.

2. The apparatus of claim 1 in which the tapered support means includes at least two opposing spaced apart members diverging outwardly from the opening to the outside of the package.

3. The apparatus of claim 2 in which the members are wires.

4. Apparatus for withdrawing strand from a wound package having a lengthwise passageway from which strand may be withdrawn comprising:

a tapered strand guide member having a passageway extending therethrough in the direction of taper with a strand guide opening at the smaller end of the member; support means locating the tapered guide with its strand guide opening in the passageway of the package; and means for withdrawing strand from the interior of the package through the strand guide opening.

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5. Apparatus of claim 4 in which the tapered strand guide is located with its strand guide opening at the mid-region of the package passageway.

6. Apparatus for withdrawing strand from a wound package having a lengthwise passageway from which strand can be withdrawn comprising:

a tapered strand guide member having a passageway extending therethrough in the direction of taper; support means locating the smaller end of the strand guide member in the passageway of the strand package; and

means for advancing the strand from the strand package passageway through the passageway of the tapered strand guide member, the strand entering such guide passageway at the smaller end of the tapered strand guide member.

7. Apparatus for withdrawing strand from a wound strand package having an axial passageway from which strand can be withdrawn comprising:

a conical guide having an axial passageway extending therethrough;

support means for locating the conical guide with its axis substantially coincident with the axis of the wound package with the smaller end of the conical

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strand guide at substantially the mid-length of the strand package passageway; and means for advancing strand from the package passageway through the conical guide passageway from the smaller end of the conical guide.

8. Apparatus recited in claim 7 in which the conical guide passageway is conical, the taper of such conical passageway being in the same direction as the guide.

9. Apparatus recited in claim 8 in which the conical guide and its conical passageway have the same angle of taper.

10. Apparatus for withdrawing strand from a wound package having a hollow central region from which strand can be withdrawn comprising:

a strand guide surface defining an opening through which strand leaving the package can travel; support means extending from outside the package locating the opening interiorly of the package; the support means flaring outwardly in all directions from the opening obliquely of the axis of the package; and

means for withdrawing strand from the interior of the package through the opening.

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