Jan. 15, 1963 D. M. BARNES ETAL 3,073,538

GROOVED STRAND GUIDE

Filed Dec. 29, 1958 2 Sheets-Sheet 1

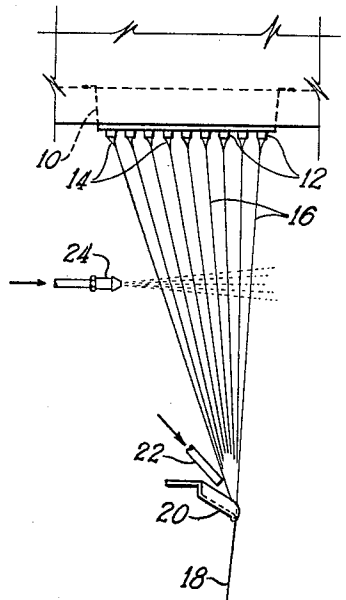
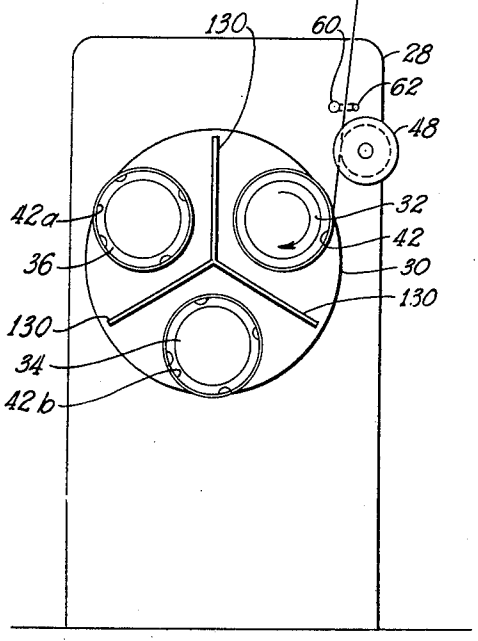


Fig. 1



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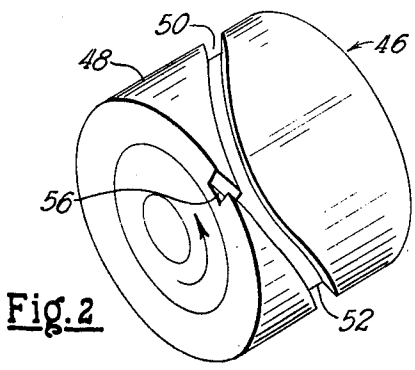


Fig. 2

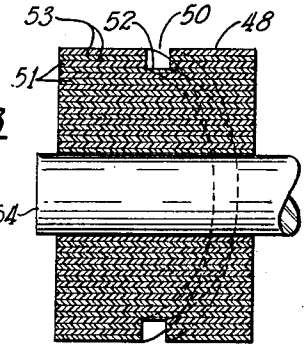


Fig. 3

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United States Patent Office 3,073,538 Patented Jan. 15, 1963

3,073,538

GROOVED STRAND GUIDE

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Filed Dec. 29, 1958, Ser. No. 783,450
3 Claims. (Cl. 242—43.2)

This invention relates to a grooved strand guide or traverse means for use with apparatus for continuously and automatically collecting a strand or strands of newly formed filaments attenuated from heat-softened glass or other heat-softenable materials or fiber-forming resins wherein the filaments are drawn or attenuated from streams of heat-softened material by winding or collecting a strand of the filaments upon a winding tube or collector rotating at a high speed, and upon completion of a wound package of strand, doffing the same and initiating the winding of a new package automatically without interrupting the linear movement of the filaments being formed.

An object of the invention resides in the provision of a novel guide or traverse means for guiding or distributing the strand lengthwise of a collector or tube formed of material which resists licking or the tendency of the strand to adhere to the traverse whereby transition or transfer of the strand from a completed package to an empty sleeve may be automatically accomplished by temporary disengagement of the strand from the traverse means.

Another object of the invention is the provision of a filament guiding means fashioned of material which does not become polished when engaged with filaments moving at comparatively high linear speeds.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

FIGURE 1 is a front elevational view illustrating semi-diagrammatically a form of winding apparatus of the invention as employed in concomitantly attenuating and winding filaments formed from streams of heat-softened material;

FIGURE 2 is an isometric view illustrating a form of strand traverse or guide means forming a component of the invention, and

FIGURE 3 is a sectional view of the traverse means illustrated in FIGURE 2.

Referring to the drawings in detail, and particularly to FIGURE 1, there is illustrated a feeder **10** containing heat-softened fiber-forming material such as molten glass which is supplied by any suitable means from a melting apparatus (not shown) or the feeder may be connected with a forehearth of a melting furnace. The feeder is provided with a comparatively large number of tips or projections **12** arranged in the bottom wall or floor of the feeder **10** and each of the projections formed with an orifice or outlet through which glass or other fiber-forming material in the feeder is discharged in fine streams **14**.

The streams are continuously attenuated or drawn into fine filaments or fibers **16**, the number of filaments drawn from a single feeder being dependent upon the number of filaments desired in a strand, and a single strand may contain upwards of four hundred or more filaments drawn from streams from a single feeder. The feeder **10** is formed of platinum rhodium or other material capable of withstanding the intense heat required to maintain the glass or other material in the feeder in a flowable condition.

The feeder may be connected with a source of electrical energy of high amperage and low voltage for heating the glass or other material within the feeder and the electrical energy controlled so as to maintain the material in the feeder at a proper viscosity so that the streams of glass flowing through the orifices in the tips **14** will be substantially uniform.

The filaments drawn from the streams of glass or other material are continuous and are brought into converging relation to form a strand **18** by means of a guide member **20** which may also be utilized to deliver a lubricant or other coating material onto the newly formed filaments. The member **20** is of trough-like configuration and a tube **22** is arranged above the member **20** and is connected with a supply of lubricant or other filament coating material which is delivered into the trough-like member **20** and is transferred onto the strand **18** by the wiping action of the filaments engaging the extremity of the member **20**.

The supply of lubricant or coating material delivered through the tube **22** may be regulated by means (not shown) in accordance with the amount of lubricant transferred to the filaments. It is essential in the production of fine filaments usable for textile strands or materials to maintain an uncontaminated atmosphere at the region of attenuation or formation of the filaments beneath the feeder **10** because the newly formed filaments seize upon foreign particles in the atmosphere and tend to cause break-outs or fracture of the filaments.

In order to reduce or prevent contamination in the region of attenuation, one or more spray nozzles **24** may be employed for delivering fine sprays or mist of water or other fluid in or adjacent the attenuating region for purging the ambient atmosphere of foreign particles.

The winding or package forming apparatus of the invention is inclusive of a housing **28** which encloses the mechanical and electrical actuating means for carrying out or performing the several steps in the winding operations. Journally supported upon the housing in suitable bearings (not shown) is a circular member or head **30** which is rotatable and, in the embodiment illustrated is adapted to be indexed or moved to three positions in the performance of winding operations.

The indexible head **30** journally supports three collets or arbors designated respectively **32**, **34** and **36** which are spaced circumferentially equal distances apart and their axes of rotation disposed at equal radial distances from the axis of rotation of the indexing head **30**. The head **30** is adapted or arranged to be moved to its successive indexed positions by means of an indexing motor (not shown) for the purpose of successively moving empty or strand-free collectors or tubes into strand collecting position and moving completed packages away from winding position.

The strand **18** is adapted to be wound upon comparatively thin sleeves or tubes, and for purposes of explanation the sleeves carried by the respective collets are designated **42**, **42***a* and **42***b*. The sleeves or collectors slidably fit on the driving arbors or collets and are adapted to be rotated at compartively high speed for winding the strand of filaments, the winding operation simultaneously forming or attenuating the streams of glass to filaments of the strand. Each of the collets **32**, **34** and **36** are driven by individual electrically energizable motors or other suitable means individual to each collet.

The collets are provided with friction shoes (not shown) or other suitable means engageable with the interior surfaces of the sleeves or collectors to effect a driving connection. The arrangement of the invention includes a strand distributing means or traverse means **46** adapted for movement in directions to distribute the strand lengthwise of a collector or sleeve for building up

a package of strand in which successive layers are deposited or wound upon the collector throughout a major length of a collector sleeve.

In the embodiment illustrated, the traverse means or strand guide is in the form of a circular cylindrically shaped member **48** having its peripheral region formed with a cam slot, recess or groove **50**, the base of which is defined by a cylindrical portion **52** of reduced diameter as shown in FIGURE 2. The strand of filaments **18** is engaged in the groove **50** for guiding the strand onto a collector sleeve. The groove **50** is preferably of the uniform motion type or shape whereby during rotation of the traverse member **48**, the strand is wound upon the collector in large overlapping helixes or convolutions in crossing, nonparallel relation.

By forming the layers of strand in the package with successive convolutions of strand in crossing relation, the tendency of the strands to adhere together is reduced to a minimum so that the liability of strand breakage when the strand is unwound from the package in subsequent processing operations, is greatly reduced. The traverse member **48** is supported upon a shaft **54** which is rotated by a motor (not shown) and reciprocated lengthwise of the collets by suitable cam means (not shown) of conventional construction for distributing the strand on a collector sleeve.

As particularly shown in FIGURE 2, an end region of the member **48** is formed with a reentrant slot or recess **56** which is located on the member **48** at the region of the closest approach of the groove **50** to the left-hand end of the traverse member as viewed in FIGURE 2. The reentrant slot **56** is in registration with the groove or slot **50** and is for the purpose of reengaging the strand in the groove **50** after transfer of the strand is effected from a completed strand package onto a fresh or empty collector.

The apparatus is inclusive of a secondary strand guiding or engaging member **60** which, in the embodiment illustrated, is in the form of a rod or shaft supported by means contained within the housing **28** and which is adapted to be reciprocated periodically by means contained within the housing **28**. The rod **60** is provided with an angularly extending projection **62** which engages the strand **18** and moves it radially away from the traverse member and lengthwise of the winding sleeve to a point beyond the distal end of the traverse member **48** and out of the path of the traverse means.

During the period in which a package is being formed on the sleeve **42***a*, the strand is distributed over the sleeve by the combined rotational and reciprocatory movements of the traverse member **48**. The construction of the strand-guiding traverse member **48** forms an important feature in the successful operation of the apparatus. The rotatable strand guiding traverse means is fashioned of material which does not set up appreciable friction upon contact with the rapidly moving strand to avoid "break outs" and is of a character which prevents the strand from "licking" or adhering thereto. It has been found that a material which becomes polished upon continued contact with the moving strand fosters "licking" or adherence of the strand to the material.

An important factor in preventing polishing of the guide means or traverse by the textile element resides in the provision of an erodible material such as a resin matrix or body filled with a material which is more resistant to wear or relatively less erodible than the resin component whereby erosion of the resin provides minute pockets or recesses between adjacent projections or particles of the filler acting as retaining recesses for sizing material, liquids or other fiber-coating or lubricating fluids.

One material which has been found satisfactory for use as a traverse member **48** is a resin-textile laminate commercially known as Micarta. The resin component **51** is a phenolic resin which bonds layers of fibrous material or textile **53** in an integrated unit. The fibrous or textile component of the unit may be fine linen, coarse cotton duck, glass fabric, either formed of chopped strand or chopped woven cloth of glass fibers.

The Micarta unit is formed by superposing the layers of textile or fibrous material in close relation and the layers or laminations impregnated with phenolic resin. The laminating layers of textile or fibrous material may be flat or disposed in successive convolutions. The cylindrically shaped traverse member such as that shown at **48** is cut from a block of the Micarta laminate with flat layers of textile or fibrous material parallel with the axis of the cylindrical member **48**.

A laminated structure is most desirable because the fibrous or textile filler forms a high strength structure which is essential for high speed rotation. The traverse formed of Micarta does not become polished by engagement with a rapidly moving strand of glass filaments and it is believed that the non-polishing characteristic ensues by reason of the presence of the fabric or fibrous laminate material in the unit.

Under the high speed travel of a strand of filaments engaging the Micarta traverse the resin component of the unit erodes or abrades at a faster rate than the textile or fibrous component and minute projections of the textile or fibrous component extend above the resin. Thus minute recesses are provided by the erosion of the resin which hold moisture, preventing a polish of the surface or area engaging the rapidly moving strand.

The Micarta material may be utilized for other forms of strand guiding or bearing means other than the cylindrical traverse member **48** illustrated in FIGURE 2 such as a stationary guide or bearing formed to provide a groove to receive the strand. The groove **50** in the traverse member **48** is preferably of a uniform motion configuration to avoid variable rate of distribution of the strand on the collecting sleeve and thereby obtain a uniform build up of the strand in the package.

The rotation of the traverse means **46** distributes the strand on the collector in high angle overlapping helixes whereby succeeding convolutions of the strand are not in parallel relation so as to prevent adherence or bonding of the convolutions of strands together. This rotation of the traverse means is referred to as microtraverse motion which is a high frequency, low amplitude motion.

The reciprocating action or axial movement of the traverse member **48** is referred to as a macrotraverse or low frequency motion. Thus the macrotraverse movement or reciprocation of the traverse member **48** is at a much lower frequency than the comparatively high frequency distribution established by rotation of the traverse member **48**.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than as herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

We claim:

1. A rotatable traverse means for guiding a linear bundle of filaments of mineral material onto a collector comprising a circular cylindrical body formed of superposed parallel layers of textile material in contiguous relation, a bonding resin distributed throughout the contiguous layers of textile material integrating the layers of textile material of the body, said bonding resin being more erodable than the mineral material of the filaments and the textile material, the solid body of resin and textile material layers having a peripheral recess angularly disposed relative to the axis of rotation of the body adapted to receive the linear bundle of filaments.

2. A rotatable traverse means for guiding a linear bundle of filaments of mineral material onto a collector comprising a circular cylindrical body formed of flat superposed layers of textile material in contiguous relation, a phenolic bonding resin distributed throughout

the contiguous layers of textile material integrating the layers of textile material of the body, said phenolic bonding resin being more erodable than the mineral material of the filaments and the textile material, the solid body of resin and textile material layers having a peripheral recess angularly disposed relative to the axis of rotation of the body adapted to receive the linear bundle of filaments.

3. A rotatable traverse means for guiding a linear bundle of filaments of mineral material onto a collector comprising a circular cylindrical body formed of flat superposed layers of textile material in contiguous relation, a bonding resin distributed throughout the contiguous layers of textile material integrating the layers of textile material of the body, said bonding resin being more erodable than the mineral material of the filaments and the textile material, the periphery of the solid body of resin and textile material layers having a circumferential groove angularly disposed relative to the axis of rotation of the body adapted to receive the linear bundle of filaments, and a reentrant slot formed in the body in communication with the circumferential groove.

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