Feb. 28, 1956 W. W. DRUMMOND 2,736,070

METHOD AND APPARATUS FOR PRODUCING FIBERS

Filed May 31, 1950 2 Sheets-Sheet 1

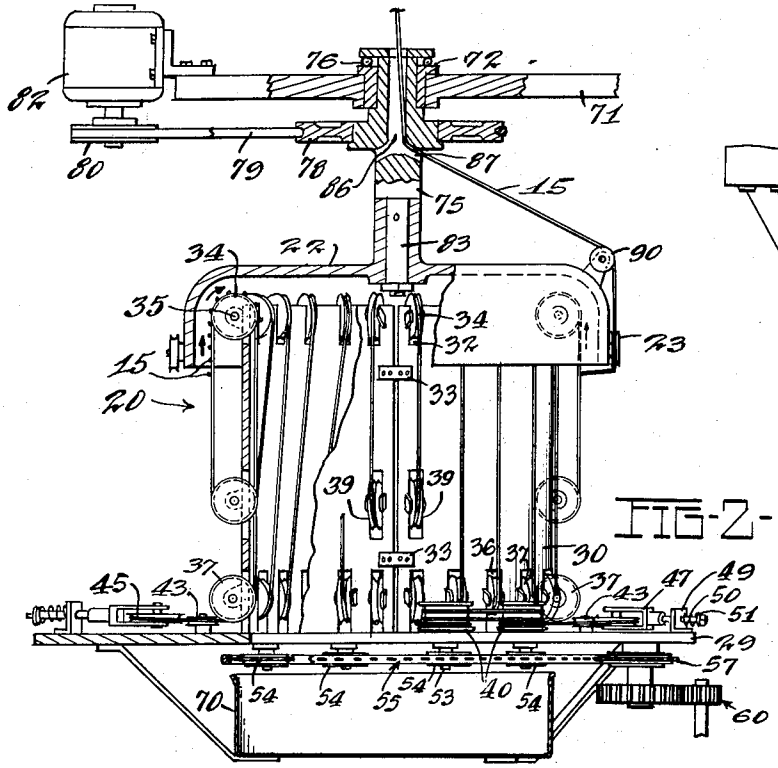

FIG-2-

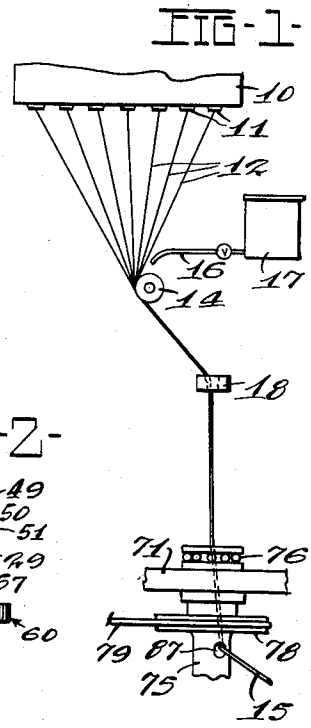

FIG-1-

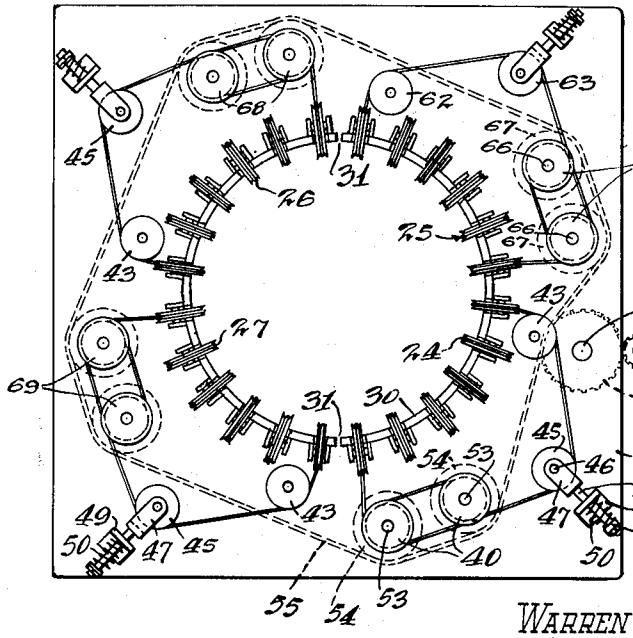

FIG-3-

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METHOD AND APPARATUS FOR PRODUCING FIBERS

Filed May 31, 1950 2 Sheets-Sheet 2

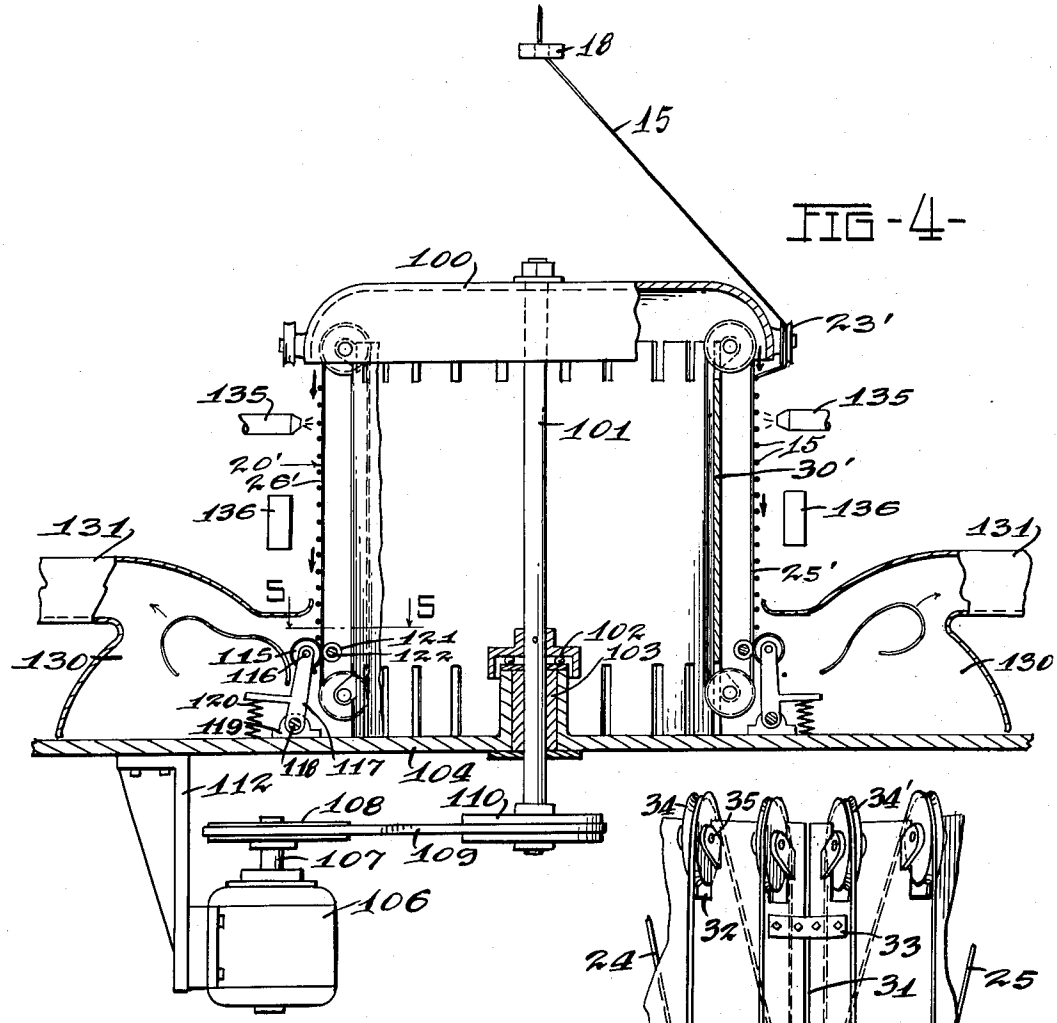


FIG-4-

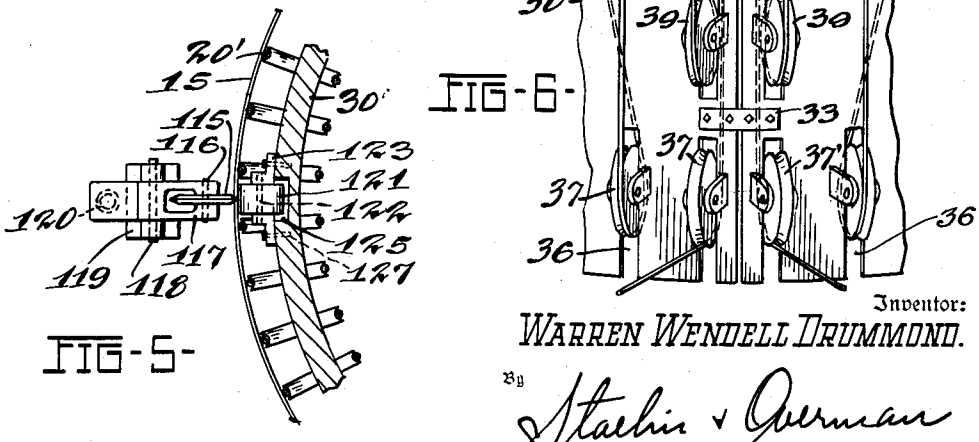


FIG-6-




FIG-5-

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United States Patent Office 2,736,070 Patented Feb. 28, 1956



2,736,070

# METHOD AND APPARATUS FOR PRODUCING FIBERS

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Application May 31, 1950, Serial No. 165,260

6 Claims. (Cl. 19—144)

This invention relates to the production of fibers or fine filaments from fiber forming materials and more especially to method and apparatus for forming, collecting and processing mineral fibers or strands of mineral fibers derived from heat softenable materials. In connection with fiber forming and collecting processes heretofore employed, it has been a practice to form fibers or filaments into strands and collect them upon a drum from which they were subsequently unwound and further processed for various purposes and uses. Such processes have been in a measure unsatisfactory for several reasons. In collecting a strand of fibers upon a drum, the nature of the operation results in the establishment of a high degree of tension in the collected strand, and as the convolutions of the collected strand build up on the drum there is a tendency of the fibers to cohere and to abrade and sever one another by reason of such tension in the strand.

In processes of the above mentioned nature the collected fibers or strands may be severed to form hanks or groups of fibers. It has been found that by reason of the tension set up in winding the fibers or strands upon a drum, that the fibers of the individual groups or hanks cohere with such tenacity that they may be separated only with considerable difficulty involving mechanical picking operations which further augment the interabrasive action of the individual fibers with the consequent result that the fibers are greatly weakened.

The present invention eliminates or minimizes the difficulties above enumerated and embraces a novel method and apparatus for forming, collecting and processing mineral fibers or filaments rendering them adaptable for use in manufacturing and fabricating a variety of products on an economical basis.

The invention has for an object the provision of a method of forming fibers or filaments by attenuation from heat softenable materials in a manner whereby continuous strands of fibers may be collected, or if desired, the collected fibers or strands may be severed to varying lengths depending upon the uses or purposes intended.

The invention contemplates the provision of a method of forming and collecting fibers or strands of fibers which is readily adaptable for the formation, collection and disposition of continuous strands without disturbing the continuity thereof, for the production of severed lengths or groups of strands, the formation and collection of the fibers or strands being carried on under conditions minimizing the tension in the collected strands so as to substantially eliminate tendencies of the fibers or strands of fibers to cohere as well as to minimize the interabrasive action through the reduction in tension in the collected strands.

Another object of the invention resides in the formation and collection of a strand of fibers in a manner providing a comparatively loose orientation thereof whereby intercohesion of the fibers may be substantially eliminated.

Another object of the invention is the provision of a strand collecting method and apparatus wherein the collected strand is disposed in convoluted helical formation in a manner minimizing the tendency of convolutions thereof to become snagged or tangled.

Another object of the invention resides in an apparatus for continuously collecting linear materials upon a flexible circularly shaped conveyor, said means being arranged to move the collected materials away from the collecting zone.

Another object of the invention resides in the provision of a flexible strand collector and conveyor of generally circular configuration wherein the strand collecting and conveying surfaces are movable in a direction to result in a helical orientation of the strands on the collector conveyor means.

Another object of the invention is the provision of a method and apparatus which are particularly suitable for continuously attenuating fibers from heat softenable, fiber forming material, the attenuated fibers accumulated in a strand configuration and the strand collected by compactly arranged means and wherein the strand may be formed and collected at a high rate of speed whereby the cost of manufacturing and processing strand materials is greatly reduced.

Still a further object is the provision of apparatus embodying means for winding a continuous strand of fibers in a generally circular path around a flexible surfaced conveyor or collector, the surface of which is continuously movable in a direction to convey the collected strand away from the strand collecting zone, the arrangement including compact fiber forming and strand collecting mechanism especially suitable for comparatively high winding speeds with a minimum of tension so that the liability of breakage of the strand is substantially eliminated.

A further feature of the invention resides in the provision of an annular group of flexible elements movable in directions relative to a strand winding or assembling mechanism to continuously deposit successive convolutions of strand on the group of flexible elements.

Another object of the invention is the provision of a method and apparatus for collecting strand material wherein a treatment of resin, binder or lubricant may be applied to the convolutions of the collected strands, the particular treatment being determined by the purposes or uses intended for the collected strands.

A further object of the invention is the provision of apparatus for practicing the method of collecting a continuous strand upon a movable carrier or conveyor which is operable to convey the collected strand away from the collecting zone and preserving the continuity of the strand which is collected at a zone remote from the conveyor.

Still a further object of the invention is the provision of a strand collecting and conveying means including one or more endless flexible elements oriented in a manner to move a strand to a zone where the strand may be deposited by the flexible elements in continuous form or the strand may be severed to predetermined lengths while in collected condition on the conveying means.

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 semidiagrammatic view illustrating a means and method of producing fibers from heat softenable, fiber forming material and orienting the fibers into a strand;

Figure 2 is an elevational view partly in section illustrating a form of apparatus of the invention for collect-

ing and conveying a strand of fibers or other linear material;

Figure 3 is a top plan view illustrating the material collecting and conveying means of Figure 2;

Figure 4 is a view similar to Figure 2 illustrating a modified form of apparatus of the invention;

Figure 5 is a fragmentary detail sectional view taken substantially on line 5—5 of Figure 4 illustrating a form of strand severing means, and

Figure 6 is an elevational view of a portion of the strand collector and conveyor illustrating certain features of the guiding means.

The method and apparatus forming the subject matter of this invention may be utilized to advantage in the collection and processing of linear materials, as for example, strands of fibers obtained from organic or inorganic fiber forming materials, but is especially adaptable for use in the formation and collection of fibers formed from heat softenable material such as glass or other materials which may be attenuated to form comparatively fine fibers. The forms of apparatus illustrated in the drawings are particularly suited to form, collect and convey a continuous strand of fibers formed from glass or other mineral material. As will hereinafter be explained the collected strand may be conveyed to a point of deposition in continuous condition or the strand may be subdivided to form groups of strands of predetermined lengths if it is desired to utilize the strand or fibers thereof in subdivided formation for further processing or fabrication with other materials. The strand of fibers may be of twisted or untwisted character as desired, depending on the products to be fabricated embodying the fibers.

Referring to the drawings in detail and initially with respect to Figure 1, there is illustrated a feeder **10** which may be in the form of a forehearth of a furnace or other receptacle adapted to contain a supply of molten mineral, such as glass or other fiber forming material. The lower wall of the feeder **10** may be formed with a series of outlets or orifices **11** through which the molten glass may flow to provide a number of streams **12**. The strand collecting and conveying means cooperates with a winding mechanism providing a motivating medium facilitating the attenuation of the molten glass streams **12** into comparatively fine fibers. The formed fibers are gathered into a strand or group by a suitable roll **14**, and lubricant applied to the fibers in order to minimize surface friction and abrasion by means of the roll **14** to which lubricant is conveyed by a tube **16** connected with a lubricant supply **17**. The strand of fibers **15** may be passed through a suitable guide or eye **18** as shown in Figure 1 to a winding mechanism.

One form of strand collecting and conveying means of the invention is illustrated in Figures 2 and 3. The strand collecting and conveying means **20** may be formed of one or more endless flexible elements or strand carriers arranged so as to provide a substantially circular or cylindrical means on which the strand is deposited or collected. It is to be understood that the fiber forming means illustrated in Figure 1 is preferably arranged above the strand winding, collecting and conveying mechanism at a substantial distance so that the strand may be directed to the winding member with a minimum of change of direction to reduce winding tension.

The strand **15** is collected or wound on the conveyor **20** through the medium of a relatively movable cap or member **22** supported adjacent the conveyor and in the embodiment illustrated is adapted for relative rotation about the axis of the conveyor. A guide means in the form of a diabolo-shaped member or roller **23** is journally supported on the periphery of the cap member **22** in position to engage the strand **15** and direct or wind the latter in a circular path upon the conveyor **20**.

It should be noted that the guide **18** is preferably positioned in alignment with the axis of rotation of the cap member **22**, and the rotation of the member **22** not only attenuates the molten glass or other material to fiber form but imparts a twist to the strand **15** formed of the fibers. The twist is in most instances rather small because of the relatively large diameter of the cylindrical means on which the strand is wound. For this reason it is desirable to provide an added degree of integrity to the strand to prevent unraveling thereof by applying an adhesive or binder to the strand, especially when the strands are severed into lengths and used in forming a mat of short strands or as a reinforcing medium for molded plastic articles and the like.

In the embodiments of the invention illustrated herein, the collector and conveyor means includes one or a plurality of endless elements formed of stranded wire cable, rope, reinforced rubber or other flexible material having adequate tensile strength for the purpose. As particularly illustrated in Figures 2 and 3, the arrangement is inclusive of four independent flexible elements **24**, **25**, **26** and **27** which are preferably driven by a common or single means in order to assure uniform linear or axial travel of the strand engaging surfaces of the flexible elements. The apparatus is supported on a suitable base plate or frame member **29** upon which is mounted a cylindrically shaped support **30** adapted to provide means for supporting and guiding the conveyor elements **24**, **25**, **26**, and **27**. The support **30** may be a length of large diameter tube, split as at **31** to admit of assembly of the flexible conveyor elements, the juxtaposed edges of the support being joined by means of removable brackets **33**, the upper edge portions of the support being formed with slots or recesses **32** accommodating pulleys or guiding means **34**. Each of the pulleys may be journaled upon a supporting shaft **35** supported upon the upper peripheral portion of the tubular support **30** or in brackets carried thereby. The lower portion of the tubular member **30** is likewise provided with a plurality of peripherally spaced recesses or slots **36** to accommodate a series of pulleys **37** journally supported upon stub shafts mounted on the tubular member **30** or in brackets secured thereto. If desired, a plurality of circularly arranged, vertically disposed struts may be used in lieu of the tubular support **30**, each strut being mounted upon the frame and arranged to support a pair of guiding pulleys for a flexible element or cable.

As particularly shown in Figure 3, the four flexible cables or elements **24**, **25**, **26** and **27** of endless character are respectively threaded or looped around four sets of upper and lower groups of pulleys, a set being disposed in each quarter section of the tubular support **30**. In the illustrated embodiment, there are six pulleys in each upper and lower group. In the first sector, one set of pulleys **34** and **37** support and guide the element **24**. In the second sector, upper and lower groups of pulleys **34'** and **37'** support the flexible element **25**. The same arrangement is established for supporting and guiding the flexible elements **26** and **27** in the remaining sectors, the four elements and their disposition in a generally circular or cylindrical shape presenting exterior axially parallel surfaces adapted to receive the strand **15** wound thereon by the cap member **22**.

As illustrated in Figure 6, each group of lower pulleys or cable guiding means is supplemented with a pair of pulleys **39**, one arranged adjacent and above each end pulley of the group. These pulleys serve to guide the end strand engaging portions of the flexible element and form a transition means whereby the flexible element may be guided around the end pulleys of the lower group so as to engage with an element driving means. In this manner the strand engaging portions may be equally spaced peripherally of the support **30** as shown in Figure 3.

Journaled upon the frame **29** is a pair of capstans or drums **40**, the end pulley **34** of the group supporting the flexible element **24** being in radial alignment with the periphery of one of the capstans so that the element **24** may be passed or looped around the capstans a suf-

ficient number of times as may be necessary to secure a satisfactory friction driving connection between the capstans **40** and the flexible element **24**. The pulley **37** at the other end of the first group of pulleys directs the element **24** to a pulley **43** supported upon a stub shaft carried by the frame, and intermediate one of the capstans **40** and the pulley **43** is an idler pulley **45**. The idler pulley **45** forms a component of a tensioning mechanism for maintaining the element **24** in taut condition. As illustrated the idler pulley **45** is journaled upon a shaft **46** carried by a clevis **47** having a tenon portion **48** extending through an opening in a bracket or projection **49** carried by the frame **29**. The end of the portion **48** may be threaded to receive an adjusting nut, an expansive coil spring **50** being disposed between the projection **49** and a collar **51** adjacent the nut, the spring exerting force on the idler pulley **45** in a direction to set up the desired degree of tension on the flexible element **24**. Other forms of tensioning means may be used as, for example, the adjusting nut may be threaded on to the tenon portion **48** into direct engagement with the projection **49** without the interpositioning of the expansive spring **50** and in this manner establish a substantially nonresilient tension factor effective in a flexible element.

The capstans **40** are driven by suitable means in order to effect movement of the flexible cable **24**. As illustrated the shafts **53** carrying the capstans are provided with sprockets **54** which are overtaken by a driving chain or other driving medium **55**. The chain **55** is engaged by a sprocket **57** mounted upon the shaft **58** and is connected through suitable reduction gearing **60** with a motor (not shown) or other suitable source of power.

The arrangement for driving the flexible element **25** is the same as that described as utilized in driving the flexible element **24**. Element **25** is threaded over a pair of driving capstans **61**, a pulley **62**, an idler pulley **63**, the latter being part of a tensioning mechanism for tensioning the element **25** of the same character as hereinbefore described in connection with the means for tensioning the flexible element **24**. The driving capstans **61** are mounted upon shafts **66** which are provided with sprockets **67** engaged by the driving chain **55** in the manner illustrated in Figure 3.

The remaining flexible elements **26** and **27** are respectively driven by capstans **68, 69** and associated means described in connection with the driving of the flexible elements **24** and **25**. It should be noted that each of the driving mechanisms for effecting linear movement of the flexible elements **24, 25, 26** and **27** are driven by common means viz. the chain **55** so that the elements move at a uniform speed.

It is to be understood that a single flexible element of the endless type may be used in lieu of the four flexible elements **24, 25, 26** and **27** if desired without departing from the spirit and scope of the invention. A plurality of flexible collector elements is preferred however because of favorable mechanical expediencies.

The apparatus illustrated in Figures 2 and 3 is especially adapted for collecting and conveying strand material in a manner whereby a continuous strand may be removed or discharged from the conveyor without interrupting its continuity whereby continuous strand material is available for subsequent fabrication in the production of various articles of manufacture. The flexible elements **24, 25, 26** and **27** are arranged in a manner so that the outermost or strand engaging surfaces thereof move upwardly or toward an open end of the conveyor in the direction of the arrows as viewed in Figure 2, carrying the collected strand **15** thereon over the uppermost pulleys **34** to the interior space bounded by the flexible elements. The continuous strand is deposited in a suitable receptacle **70** disposed beneath the conveyor **20**.

The strand winding member or cap **22** may be supported upon a suitable frame **71** disposed above the member **22**. As illustrated, the frame **71** is provided with guide bearings **72** in which is journaled a shaft **75**, an antifriction thrust bearing arrangement **76** being arranged to support the shaft **75** and member **22**. Driving means is provided for rotating the shaft **75** and member **22** and includes a pulley wheel **78** mounted upon the shaft **75** connected by means of a belt **79** with a pulley **80** driven by a motor **82** or other source of power. The shaft **75** is formed with a portion **83** which carries the cap member 22. The shaft **75** is provided with a hollow interior or channel **86** which has an outlet or opening **87** through which the strand **15** is channeled or directed to the winding member. The strand may engage a suitable roller **90** carried by the cap member **22** to properly direct the strand to the roller **23** over which the strand passes during rotation of the winding member to deposit the strand upon the conveyor **20**.

In the operation of the apparatus shown in Figures 1 through 3, the streams of molten glass **12** produce fibers which are passed over the roller **14** and gathered into strand configuration **15** which is directed through the guiding member or eye **18**, the channel **86** and an outlet **87** in the shaft **75**, thence over the guide **90** and roller **23** carried by the cap member **22**, the latter being rotated by the motor **82**. The rotation of the cap member **22** continuously attenuates the glass streams into fine fibers, and the strand **15** formed of the fibers is continuously wound or deposited upon the collector and conveyor mechanism **20**. Concomitantly with the rotation of the cap member **22** and the winding of the strand **15** upon the conveyor **20**, the flexible cables **24, 25, 26** and **27** driven by the capstans **40, 61, 68** and **69** through the speed reducing mechanism **60** advance the strand engaging surfaces thereof in the direction of the arrows as viewed in Figure 2. By this method the strand **15** is continuously collected upon the flexible cables in convoluted configuration and as the portions of the flexible cables carrying the strands are moving axially of the conveyor, the convolutions of strand are thereby advanced in an upward direction. As the strand engaging surfaces of the flexible elements **24, 25, 26** and **27** move around the upper groups of pulleys **34**, the convolutions of strand **15** are moved around the pulleys **34**. As the successive convolutions reach the space circumscribed by the flexible elements, they are ejected thereinto and pass downwardly into the receptacle **70** where they are deposited in continuous strand formation.

A continuous strand is thus formed by attenuating fibers, gathering them into strand formation, collecting the strand upon a movable conveyor under a minimum of winding tension, and moving the strand to a zone of discharge from the conveyor yet maintaining the continuity thereof so that continuous strands are obtained for further processing, orientation or incorporation in other articles of manufacture. Continuous strands are particularly useful as reinforcing mediums in manufactured articles such as resilient mats of mineral fibers, particularly those of glass fibers, reinforcement for mats of insulation materials especially for industrial purposes, reinforcement laminae for laminated paper, cardboard and the like, and reinforcement for mats of mineral fibers utilized for wrapping pipes to prevent corrosion and deterioration particularly where the pipes are laid underground.

It should be noted that by varying the comparative speeds of rotation of the cap member **22** and the linear travel of the strand collecting and conveying cables **24, 25, 26** and **27** by changing the speed ratio of the mechanism **60** or changing the sizes of the pulley wheels **78** and **80**, the winding speed of the strand **15** may be correlated with the linear movement of the conveyor so that different amounts of overlap of the convolutions of strands may be obtained or the speeds may be regulated

so that successive convolutions of strands deposited upon the conveyor do not overlap at all.

It is furthermore to be noted that the driving means for the strand collecting and conveying cables is of a comparatively simple nature yet very effective and reliable in its operation and one which occupies comparatively small space. It is also of such a compact nature as to render the apparatus readily portable for use with different types and kinds of fiber forming means without material change or adjustment of the apparatus. The arrangement is admirably suited for producing continuous strand or linear material at comparatively high rates of speed resulting in effective savings in the cost of such materials.

Figure 4 illustrates a modified form of apparatus for carrying out the principles of the invention. The strand collecting and conveying means 20' is of the same character as illustrated in Figures 2 and 3 and is inclusive of four flexible cables or elements mounted on a support 30' and providing strand collecting and conveying means, two of the elements being illustrated in the sectional view at 25' and 26'. The driving arrangement for the flexible cables in this form of invention is identical with that disclosed in Figures 2 and 3 hereinbefore described. In this form of the invention the strand collecting and conveying cables are moved in the opposite direction, that is, the outermost portions presenting the strand collecting and conveying surfaces are moved downwardly in the direction of the arrows in Figure 4, thus carrying the strand downwardly to a strand discharge zone.

A cap member 100 of similar construction to the cap member 22 is provided with a guide or roller 23' for directing or winding the strand on the conveyor formed by the flexible cables through the rotation of the cap member 100. The cap member is preferably supported upon a shaft 101 mounted in suitable antifriction bearings 102 and guide bushings 103 supported by a frame 104. Driving means is provided for the shaft 101 in the form of a motor 106, the shaft 107 of which is provided with a pulley 108 driving a belt 109 overtaking a pulley 110 secured to the shaft 101. The motor 106 may be mounted upon a suitable bracket 112 depending from the frame 104.

The form of the invention illustrated in Figure 4 is especially adaptable for continuously collecting strand material and conveying the strand material to a discharge zone, the arrangement including means for severing or dividing the continuous strand collected on the flexible elements into predetermined lengths. In fulfillment of this purpose there is provided strand severing means which, in the embodiment illustrated in Figures 4 and 5, may consist of one or more severing units disposed peripherally of the flexible elements in position to engage and sever the strands into desired lengths. One form of strand severing means includes a severing wheel 115 mounted upon a stub shaft 116 carried by a bracket 117 the latter being journaled by means of a stub shaft 118 on a bracket 119 secured or mounted upon the frame 104, an expansive spring 120 biasing the severing wheel toward strand severing position. The severing wheel 115 is adapted for cooperation with an abutment roller 121 which may be journaled upon a stub shaft 122 carried by a bracket 123. The backing roller 121 may be supported by the tubular support 35, the latter being provided with a recess 125 formed therein to accommodate the roller 121. The arrangement of strand severing means illustrated is shown in Figure 5. The bracket 123 may be secured to the tubular support 35 by removable means such as screws 127 whereby the severing unit may be disposed at any desired position peripherally of the support 30'. The convolutions of strand are successively cut by the severing wheels 115 as they move into contact therewith. A plurality of severing units may be utilized and spaced about the periphery of the strand conveyor 20', the particular positions of the severing units depending upon the lengths of strand desired. It is to be understood that any type of strand severing means may be utilized as for example an electrically heated wire or a strand severing flame may be utilized in lieu of the mechanical means illustrated.

Means may be provided for carrying away the severed lengths of strand from the severing or strand discharge zone. In the embodiment illustrated a shield or hood 130 encompasses the strand severing devices and the discharge zone. A suitable tubular means 131 is in communication with the hood 130 and a suitable suction device employed to establish a zone of reduced pressure or subatmospheric pressure within the hood 130, the differential pressure causing the severed strands to be moved through the tubes 131 and discharged at a point remote from the strand collecting device.

For certain particular uses of the strands it may be desirable to apply a resin or binder to the convolutions of strand as they are collected upon the flexible elements. As illustrated in Figure 4, a plurality of nozzles or jets 135 may be disposed adjacent the collected strands for spraying or delivering suitable resin or binder to the strand. If desired, the resin may be cured by suitable heating elements or burners 136 disposed adjacent the resin or binder applying devices.

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

I claim:

1. Apparatus for collecting and conveying fibers including a support; an endless cable; guiding means for supporting said cable whereby portions thereof are disposed in adjacent relation presenting fiber collecting surfaces; means for driving said cable at a substantially constant speed to move the fiber collecting surfaces simultaneously in one direction; means movable relative to the collecting surfaces for depositing fibers on said surfaces; means for establishing tension in said cable, said cable guiding means being arranged to modify the direction of movement of the fiber collecting surfaces to effect a discharge of the collected fibers therefrom.

2. Apparatus for collecting linear material including a support; a nonrotatable material collecting means including an endless flexible element associated with said support; said flexible element being arranged whereby portions thereof are disposed to form a plurality of material collecting surfaces; means movable relative to the collecting surfaces for depositing linear material on said surfaces; actuating means for said flexible element to continuously move the material collecting surfaces in a direction lengthwise of the collecting surfaces to convey the material away from the collecting surfaces; guiding means for said element for effecting a change in direction of movement of the material collecting surfaces to effect disengagement of the material therewith, and means for maintaining said flexible element in a state of tension.

3. Apparatus for attenuating and collecting fibers in strand formation from streams of heat-softenable material including a rotatable member, a nonrotatable strand-collecting means including an endless flexible cable arranged to present a plurality of strand-collecting surfaces, strand-guiding means carried by the rotatable member engageable with the strand of fibers, means for rotating said member to attenuate the fibers by winding the strand of fibers upon the strand-collecting surfaces, means for continuously moving the cable at a substantially constant speed to cause the strand to be deposited thereon in successive, spaced convolutions and to convey the strand convolutions away from the fiber-depositing zone, said cable-moving means including a rotating means including a rotating capstan in frictional engagement with the cable, means for rotating the capstan at a substantially constant speed, and a tensioning mechanism for maintaining said cable in taut condition.

4. The method of orienting a strand of mineral fibers including the steps of continuously winding the strand around a generally cylindrical nonrotatable support with the strand convolutions deposited in spaced helical formation, advancing the strand while in helical formation in a rectilinear direction along the support into an enclosed zone, serving the strand into predetermined lengths within the enclosed zone, establishing differential pressure in the enclosed zone to move air through the zone, and removing the severed lengths of strand from the severing zone by the air moving through the enclosed zone.

5. Apparatus for attenuating and collecting a strand of fibers formed from streams of heat-softenable material including a frame, a rotatable member, a nonrotatable strand-collecting means carried by the frame and including an endless flexible cable, a plurality of pulleys carried by said frame and supporting the cable whereby portions of the cable are disposed in substantial parallelism, strand-guiding means carried by the rotatable member engageable with the strand of fibers, means for rotating said member to attenuate the fibers by winding the strand upon parallel portions of the cable of the strand-collecting means, driving means for continuously moving the cable at a substantially constant speed to cause the strand to be deposited thereon in successive spaced convolutions and to convey the strand convolutions away from the fiber collecting zone, and resiliently biased tensioning means for maintaining the cable in taut condition.

6. The method of attenuating and collecting mineral fibers including the steps of continuously gathering a plurality of mineral fibers into a strand, attenuating the fibers



of the strand by continuously winding the strand around the exterior of a circular cylindrical formation of strand receiving surfaces, advancing the strand receiving surfaces longitudinally at a substantially uniform rate of speed to cause the strand to be deposited thereon in spaced convolutions and to move the convolutions away from the collecting zone, and altering the paths of movement of the surfaces in directions establishing a second circular cylindrical formation of the surfaces interiorly of the first circular cylindrical formation whereby the strand is continuously discharged from the surfaces into a zone bounded by the second circular cylindrical formation of the surfaces.

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