Aug. 10, 1954 J. F. COURTNEY ET AL 2,685,763

GLASS FIBER DRAWING MECHANISM

Original Filed May 11, 1951

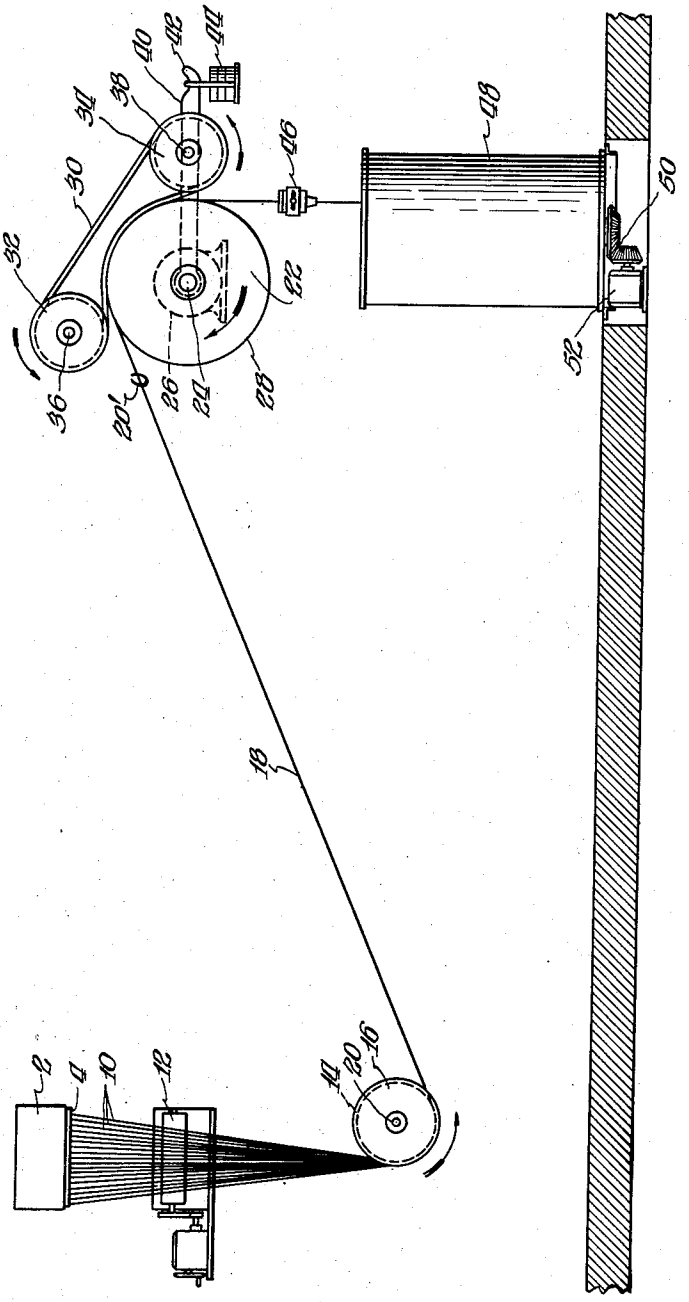

Fig. 1

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Patented Aug. 10, 1954 2,685,763

UNITED STATES PATENT OFFICE

2,685,763

GLASS FIBER DRAWING MECHANISM

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Original application May 11, 1951, Serial No. 225,883. Divided and this application June 6, 1952, Serial No. 294,687

5 Claims. (Cl. 49—17)

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This invention relates to a novel apparatus for attenuating a thermoplastic material and has specific reference to the manufacture of glass fibers in the making of glass strands and the like. This application is a divisional of our application Serial # 225,883, filed May 11, 1951, for Glass Fiber Drawing Mechanism and Process.

Elemental glass fibers are characterized by low tensile strength, susceptibility to abrasion and fracture and extreme fragility and brittleness. Due to this nature of the material and the high speed for drawing the material into fiber form, extreme difficulty has been experienced in providing a satisfactory drawing mechanism which will afford a positive grasp on the strand without deformation and provide a sustained substantially even pull on the strand to obtain approximately uniform characteristics with regard to flexibility, diameter, texture, etc. throughout its length.

A general object of the invention is to devise a novel drawing mechanism which obtains a gentle grasp on a substantial length of a strand and effects an approximately uniform pull on the strand without imposing high transverse stresses thereon.

A further object is to obtain an arrangement which provides a grasp on the strand by continuously moving opposed endless surfaces moving about predetermined axes in such manner as to utilize the centrifugal forces thereon to bias the surfaces towards each other and produce a grasping effect on the strand.

A more specific object is to provide a drawing device presenting opposed continuous surfaces receiving an extensive length of the strand therebetween, at least one of these surfaces being directly actuated and at least one of these surfaces being yieldably urged against the strand by impressing a centrifugal and/or other force thereagainst.

The invention comprehends in one embodiment the provision of a drawing wheel with a peripheral strand engaging surface and a belt biased against an extensive length of the surface.

These and other objects of the invention will become more apparent from the specification and drawings wherein:

Figure 1 is a side elevational view of one form of the invention with environmental components shown diagrammatically.

Describing the invention in detail and referring first to the embodiment shown in Figure 1, the furnace 2 has a bottom die plate 4 through

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which the molten glass in the furnace flows by gravity to form a plurality of filaments 10, 10 which are gathered by the operator and manually drawn over an applicator assembly 12 which coats each filament individually, due to the fan spread arrangement thereof, with a coating which is preferably a plastic. The filaments are converged into a V-groove 14 of a sheave 16 which associates the filaments 10 into a strand 18 while the coating is still adherent whereby it may coalesce to form a bonded mass holding the filaments grouped in parallel. Sheave 16 may be mounted as at 20. The strand then extends through a guide fork 20' to the top side of drawing wheel 22, which is actuated or rotated by a shaft 24 of a driving motor 26. The strand engages the wheel along the circumferential surface 28 and is maintained thereagainst by means of a belt 30 which is yieldably pressed to assume the arcuate contour of the opposing portion of the drawing member 22. The endless belt 30 is trained around two sheaves 32 and 34, sheave 32 being disposed above member 22 and preferably at one side of the shaft 24, as seen in Figure 1, on a preferably fixed axis 36. The sheave 34 is journaled as at 38 to an arm or cantilever member 40 intermediate the ends thereof, the inner end of member 40 being rotatably supported on the shaft 24 and the outer end of member 40 providing a hook 42 from which may be supported a plurality of weights 44 constantly biasing the arm 40 downwardly and thus yieldably holding the sheave 24 in engagement with the belt 30 and tensioning the same. Obviously the weights may be replaced by other tensioning means such as a spring. It will be seen that the belt 30 has a grasping extent of almost 90° and engages the strand 18 over an extensive length thereof and that the path of travel of the strand is along a gently curved continuous surface which affords a light grasp on the strand without deformation and of sufficient magnitude to provide the necessary pull on the strand and obtain a uniform and continuous drawing thereof and resulting uniformity in the physical characteristics of the fibers. It will be observed that sheaves 32 and 34 are spaced a sufficient distance from the surface 28 to permit passage of a workman's hand between the same if the workman should accidentally insert his hand therebetween when initially placing the strand between the drawing surfaces.

It will be understood that the drawing operation is initiated manually by the workman who collects the filaments 10, 10 as they issue from

the plate 4 and then draws the same over the applicator assembly 12 and then under the gatherer and then through the centering fork 20 and between the grasping surface 28 and the belt 30 while the drawing wheel 22 is rotated in the direction of the arrow. Initially the strand 18 is coarse and relatively inflexible and this portion of a strand after it is discharged from the drawing means is discarded. After the drawing attains the determined rate, the filaments assume desired characteristics, to wit, thin diameter, flexibility and fine textures the strand is passed through a nozzle 46 which is identical with that shown in our companion U. S. application entitled Glass Fiber Drawing Mechanism and Process Serial No. 221,596 filed April 18, 1951.

The nozzle 46 comprises a plurality of parts which are assembled about the thin strand and is positioned in vertical alignment with the vertical tangent coaxial with the strand and passing through a point on a substantially horizontal plane containing the axis of the shaft 24. The nozzle 46 is activated by delivering air under pressure therethrough to impress a slipping dynamic tensile force on the strand slightly greater than the speed of discharge of the strand from the drawing member. The mild pulling action of the air nozzle does not exert sufficient force to snap the strand.

In addition to the cantilever arrangement drawing the belt 30 against the strand, the rotation of the belt about its axis produces a centrifugal force which acts transversely of the strand and urges the belt against the strand and the latter into intimate contact with the surface 28 of the drawing element.

The strand is deposited with a directed downward attitude into a container 48 which may comprise a cylindrical drum open at the top and rotated about its central axis by means of a suitable drive arrangement 50 driven by a motor 52. It will be noted that the strand is deposited eccentrically of the axis of rotation of the canaster in order to obtain suitable coping or packaging of the strand.

In the instant design the centrifugal force together with the initial tensioning adjustment grasps the strand, and the strand is drawn on a curved surface over an extensive length thereof. A gentle grasp is achieved together with the requisite frictional development to obtain the desired pull on the material without deforming the material or fracturing the same.

What is claimed is:

1. In a glass fiber drawing apparatus, a rotatable drawing wheel having a peripheral drawing surface, driving means operatively connected thereto, a belt loop having a length in engagement with said surface and having a first end defining an intake with said surface and a second end defining an outlet with the surface, a sheave rotatably supporting each end of the loop, the sheave at said first end rotatable on a fixed axis, a cantilever having one end pivoted on the axis of rotation of said wheel, means rotatably supporting the other sheave on said cantilever intermediate the ends thereof, said other sheave movable with said cantilever on an arc concentric with said surface and wrapping said belt length concentrically about said surface, and variable weight means carried by the cantilever at the other end thereof.

2. In a glass fiber drawing apparatus, a rotatable drawing wheel presenting a peripheral drawing surface, driving means operatively connected to said wheel at the axis of rotation thereof, a belt loop having a run wrapped against said surface and defining a fiber grasping area therewith and affording an intake end upstream of the direction of rotation of said wheel and a discharge end downstream of said direction of rotation of said wheel, rotatable mounting means for each end of the loop, the means at said intake end disposed on a stationary axis, a movable support for the mounting means at said discharge end and pivoted on said axis, of rotation of the wheel and carrying said last-mentioned mounting means adjacent to said periphery and providing path of movement for said last-mentioned mounting means concentrically about said surface.

3. A drawing apparatus according to claim 2 wherein said movable support comprises a cantilever adapted to swing in a direction loosening said run from said surface at said discharge end to dissipate excessive centrifugal action against the belt without disengaging the entire length of said run from said surface.

4. A drawing apparatus according to claim 2 wherein said support comprises a cantilever, and adjustable weight means mounted upon the cantilever to effect a hold down of the belt with said run thereof against said surface.

5. In a drawing apparatus for glass filaments a drawing assembly adapted to attenuate the filaments, comprising a drawing wheel with a peripheral drawing surface adapted to receive the filaments thereagainst, biasing means for snubbing the filaments against the surface and comprising an endless belt loop having a length opposing the surface and pressed thereagainst in grasping relationship to the filaments, and means positioning the belt along the surface comprising a pair of sheaves in the loop at opposite ends of said length, the sheave at one end of said length being carried on a substantially fixed axis, driving means for the wheel connected thereto at the axis of rotation thereof, a support for the other sheave connected thereto and pivoted on said axis whereby said other sheave is swingable in an arc concentric with said surface to obtain a maximum extent of concentric engagement between said length and the surface, and means operatively associated with said support for urging it in a direction engaging the length with said surface, said last-mentioned means being variable to effect adjustment of the biasing load in accordance with the character of the coating applied to the strand to prevent slipping of the strand between the surface and said length of belt.

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