

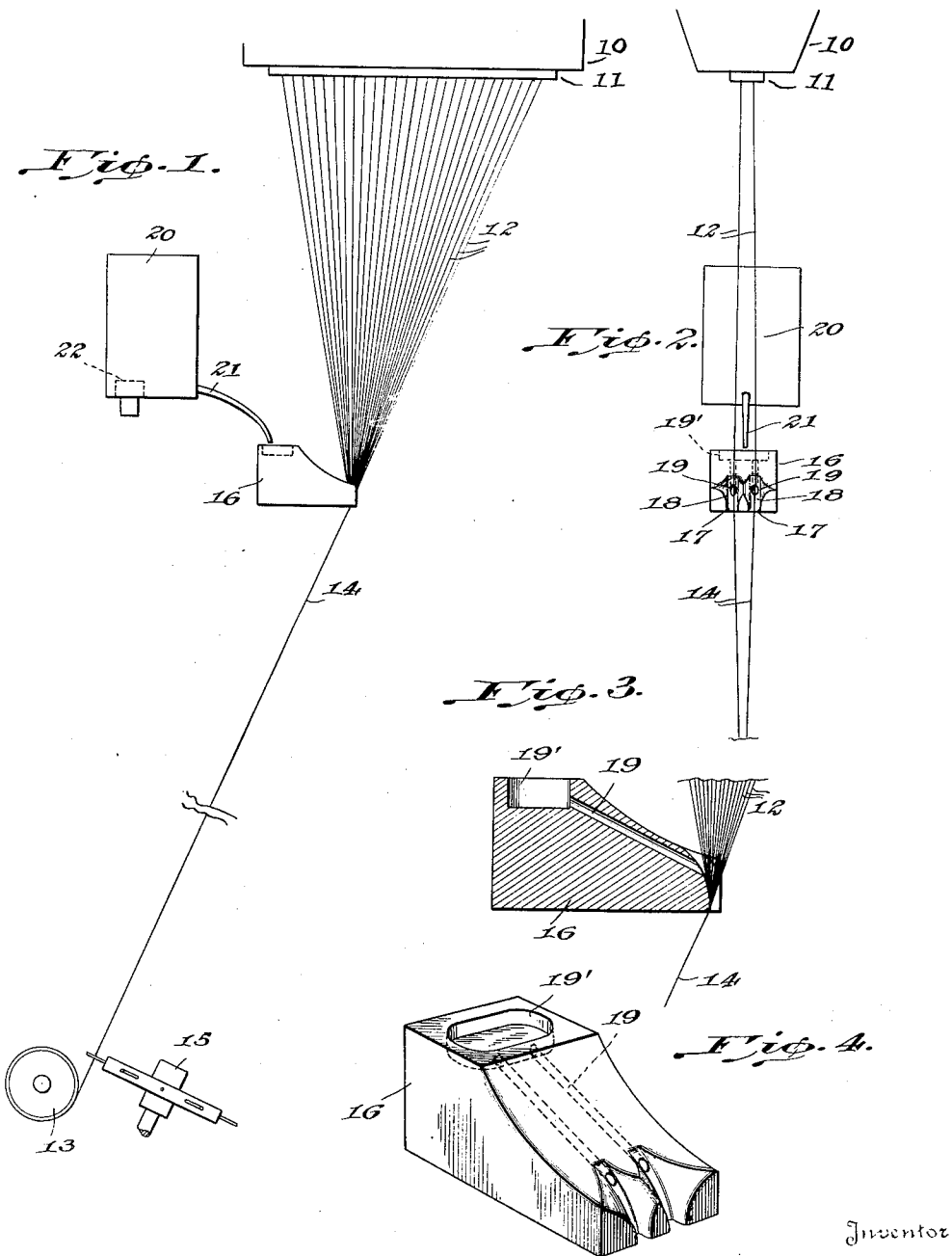
April 3, 1945.

D. KLEIST

2,373,078

GUIDE FOR GLASS AND THE LIKE FIBERS

Filed Feb. 16, 1943



UNITED STATES PATENT OFFICE

2,373,078

GUIDE FOR GLASS AND THE LIKE FIBERS

Dale Kleist, Newark, Ohio, assignor to Owens-Corning Fiberglas Corporation, a corporation of Delaware

Application February 16, 1943, Serial No. 476,033

9 Claims. (Cl. 91—43)

This invention relates generally to the art of manufacturing slivers, strands or yarns from materials of the type capable of being drawn to form extremely fine fibers when in a viscous condition and refers more particularly to improved means for applying a lubricant or coating on the fibers after they are attenuated and prior to their being collected as by being wound on a spool.

One highly satisfactory method of producing threads or strands consists in drawing a plurality of substantially continuous fibers from a molten body of the selected material and collecting the fibers in strand form by passing the same over a pad or guide. The pad usually performs the additional function of applying a lubricant and/or binding substance to the individual fibers. The application of a lubricant on the fibers is particularly important in cases where the fibers are formed of glass or some material having characteristics similar to glass. In such cases the lubricant reduces the abrasive action of the material to a minimum and prevents adjacent fibers from scratching each other. Binding material such as resin, gum, starch and the like is usually admixed with the lubricant, the function of the binding material being to secure the fibers together in the strand.

Pads for contacting glass fibers are ordinarily provided with a covering of flannel or other cloth to act as a wick or reservoir to feed the lubricant and binder to the fibers. The fibers are drawn over the cloth covering on the pad at a very high rate of speed resulting in considerable friction at the pad and rapid wear of the cloth covering. This friction and wear of the cloth covering fosters frequent breakage of the fibers during the drawing operation.

Considering that the production of the fibers is most efficiently a continuous process, breakage of one or more of the fibers makes it necessary to interrupt production of the equipment until the defect can be remedied. Such interruptions in the operation of the equipment and the need for frequent renewal of the cloth covering on the pad reduce production and are highly objectionable.

The present invention overcomes the above objection to a great extent by providing an improved pad or guide formed of a material having substantial wear resisting qualities and capable of withstanding continuous operation over a relatively long period without breaking or otherwise harming the fibers. In accordance with this invention the above desirable characteristic is obtained by forming the pad of a material which

inherently possesses sufficient lubricating qualities to reduce the friction on the fibers to a minimum during the drawing operation.

More particularly, this invention contemplates forming the guide pad or, at least the guiding surface of the pad from graphite which possesses the lubricating qualities required to enable the fibers to be drawn over the guide surface of the pad with the minimum friction. As a result, the life of the pad is substantially increased and interruptions in production heretofore required to replace worn pads or correct the condition caused by broken fibers is correspondingly reduced.

Another object of this invention, which contributes materially to obtaining the desired results, is to provide a guide or pad adapted to feed coating substances such as lubricants and binding materials to the strand without resort to cloth or other wicking, thereby dispensing with any parts that would need frequent renewal. This is attained by forming the guide of the present invention with a supply passage for the coating substance and having the delivery end thereof opening through the guiding surface of the guide so that fibers pass the same during the drawing operation. Movement of the fibers past the delivery end of the supply passage has the effect of drawing the coating substance through the passage and results in feeding the coating substance at a rate substantially corresponding to the rate of travel of the fibers over the guide.

Still another object of this invention is to provide a guide having a guide surface which is curved in a manner to distribute the fiber stress over a relatively large area of the guiding surface of the guide. With this arrangement any wear caused by drawing the fibers over the guide is distributed over a larger area of the guide surface on the guide.

A further object of this invention is to provide a guide adapted to divide a strand into a number of smaller strands or groups and apply lubricant or the like to these smaller strands. This feature is desirable because it facilitates more thorough coating of the fibers with the lubricant.

The foregoing, as well as other objects, will be made more apparent as this description proceeds especially when considered in connection with the accompanying drawing, wherein:

Figure 1 is a diagrammatic elevational view of fiber producing equipment embodying a guide constructed in accordance with this invention;

Figure 2 is a front elevational view of a part of the equipment shown in Figure 1 and also fea-

turing the improved guide construction forming the subject matter of this invention;

Figure 3 is a vertical sectional view through the guide shown in Figures 1 and 2; and

Figure 4 is a perspective elevational view of the guide.

The device forming the subject-matter of this invention is especially applicable to equipment of the type employed in the manufacture of slivers, strands or yarns from various materials capable of being flowed while in a viscous condition and drawn into extremely fine fibers or filaments.

One group of materials suitable for the above purpose may be defined as thermoplastic. These materials assume a viscous condition when heated and are capable of being drawn into fine fibers. Examples of such thermoplastics are glass, cellulose acetate, sugar, artificial silk, "nylon," and vinylene chloride resin.

Although the present invention may be advantageously used in the fabrication of any one of the above or other materials having similar characteristics, nevertheless, glass is selected for the purpose of illustration because the invention has been found highly advantageous in the production of fibers from this material. Glass possesses abrasive characteristics and, accordingly, tends to rapidly wear the pads and guides previously used.

In accordance with conventional practice, a quantity of molten glass is stored in a container 10 having a bushing 11 at the bottom thereof through which the molten glass flows in the form of a multiplicity of fine continuous streams 12. The streams are drawn or attenuated at a high rate of speed to form substantially endless relatively fine fibers by a winding drum or spool 13 rotated at the required rate of speed by any suitable driving mechanism not shown herein. The fibers are gathered to form a strand 14 prior to winding the same on the spool 13 and the latter is traversed by the strand 14 to form a package on the spool. The traversing mechanism is indicated in the drawing by the reference character 15 and may be any one of a number of accepted designs.

The fibers are grouped into a strand by a guide 16 suitably supported between the container 10 and attenuating spool 13 in a position to contact the streams of glass issuing from the bushing 11 after the streams have been attenuated and solidified to form fibers. The material from which the guide is formed inherently possesses lubricating characteristics and especially satisfactory results have been obtained by employing graphite. This graphite is obtainable commercially in the form of blocks, bars and the like under the trade-name "Karbate," a product of the National Carbon Company, and is used to make brushes for electrical motors, contactors, electrodes and other products. As is well known, such material is usually made by combining powdered graphite (carbon) with clay or other suitable binding materials and the blocks or bars are formed by pressing the powder and binder into the desired shape. This material has the quality of reducing the friction of the glass fibers passing over the guide and, as a result, of this reduced friction the life of the guide is not only increased but breakage of the fibers is reduced to a minimum.

The guide also serves to gather a plurality of fibers into a strand and for this purpose is formed with a relatively narrow groove 17 through which the fibers are compelled to pass during the draw-

ing operation. The bottom of the groove forms a bearing surface 18 for contact with the fibers and is curved tangent to the fibers to distribute the pressure of the fibers over a substantial area of the guide surface.

The number of grooves in the guide may be varied in dependence upon the capacity of the bushing or upon the number of fibers produced. For the purpose of illustration, the guide is shown as having two guide grooves spaced laterally from each other. The fibers produced from the bushing 11 are gathered into two strands by the double grooved guide and these strands are, in turn, joined below the guide into a single strand.

The multi-grooved guide is especially advantageous in cases where the individual fibers are coated with a material such as a lubricant and/or binder. It permits application of the material individually to parts of the strand and thus insures more complete and uniform application of the material to the individual fibers as the latter are drawn over the guide.

The fiber coating material is conducted to the bearing surface 18 of each groove 17 by means of a passage 19 extending through the guide. The entrant end of each passage opens into a chamber 19' in the top of the guide for receiving the coating substance and the delivery ends of the passages respectively open through the upper portions of the guiding surfaces 18 of the grooves. The arrangement is such that the fibers pass over or adjacent the delivery ends of the passages and produce, apparently, a slight reduction in pressure at the ends of the passages and thus a slight drawing action on the coating material in the passages. This action aids in supplying the coating substance to the fibers at a rate which corresponds substantially to the speed of the fibers passing over the guide and contributes materially to applying the desired amount of coating material on the individual fibers.

As shown in Figure 1, the selected coating substance is contained in a receptacle 20 supported above the guide 16 and having a discharge conduit 21 adapted to feed the coating material into the chamber 19' in the top of the guide. The discharge conduit communicates with the receptacle at the bottom of the latter and is arranged to supply the coating substance to the guide by the action of gravity but any other means for feeding the material into the chamber 19' at the desired rate may be used.

In operation of the present device, a suitable coating material such as one containing alone or in mixture, vegetable, animal or mineral oils, sulfonated oils, wax, bitumens, fatty acids, starch and the like, is placed in the receptacle 20 and fed through the chamber 21 to the passages 19 in the guide 16. The flow of the coating material through the passages to the guiding surfaces 18 of the grooves 17 in the guide 16 is facilitated by the action of the fibers passing over the delivery ends of the passages and, as a result, a uniform coating of the substance is applied to the individual fibers regardless of the rate of fiber attenuation within reasonable limits. This feature together with the fact that the guide 16 is formed of graphite minimizes the friction at the surfaces 18 of the guide and, as a consequence, the life of the guide is not only increased but breakage of the fibers at the guide is materially reduced.

I claim:

1. A device for grouping a multiplicity of glass fibers in strand form as they are continuously being attenuated, which comprises a body of

graphite having a groove for gathering the fibers during the attenuating operation.

2. A device for grouping a multiplicity of glass fibers in strand form as they are continuously being attenuated, which comprises a guide having a fiber engaging guiding surface formed of graphite, and means for feeding a coating material to the guide for application to said fibers including a passage extending through the guide and having the delivery end opening through the portion of the guiding surface over which the fibers are drawn.

3. A device for guiding a multiplicity of glass fibers as they are being attenuated, which comprises a guide having a graphite surface over which the fibers are drawn and provided with a supply passage for a coating material having the delivery end opening through the portion of the graphite guiding surface over which the fibers are drawn.

4. A device for grouping a multiplicity of glass fibers into a plurality of strands as they are being attenuated which comprises a guide having a plurality of laterally spaced grooves respectively receiving groups of fibers and having graphite guiding surfaces in the grooves over which the fibers are drawn.

5. A device for grouping a multiplicity of glass fibers into a plurality of strands as they are being attenuated which comprises a guide formed of graphite and having a plurality of laterally spaced grooves respectively receiving groups of fibers.

6. A device for grouping a multiplicity of glass fibers into a plurality of strands as they are being attenuated which comprises a guide having a plurality of laterally spaced grooves respectively receiving groups of fibers and having graphite guid-

ing surfaces in the grooves over which the fibers are drawn, and means for supplying a coating material to each of the grooves including passages in the guide having the delivery ends respectively opening through the graphite guiding surfaces of the grooves.

7. A device for guiding a multiplicity of glass fibers as they are attenuated comprising a guide formed of graphite, a fiber-engaging guiding surface on said guide, a chamber in said guide located at least partly above a portion of said guiding surface, and a passage connecting said chamber and said guiding surface, whereby fluid in said chamber is fed by gravity to said guiding surface to coat the fibers in engagement therewith.

8. A device for guiding a multiplicity of glass fibers as they are attenuated comprising a guide in the form of a block of graphite tapering in the vertical direction toward one end, a guiding groove extending vertically across said end, and through which the fibers pass, a recess in the upper face of said block adjacent the opposite end thereof, and a passage through the block connecting said recess with said groove for feeding fluid from said recess into said groove.

9. A device for guiding a multiplicity of glass fibers as they are attenuated comprising a guide in the form of a block of graphite tapering in the vertical direction toward one end, a plurality of spaced guiding grooves extending vertically across said end and through which the fibers pass in a plurality of strands individual to said grooves, a recess in the upper face of said block adjacent the opposite end thereof, and passages through the block connecting said recess with said grooves for feeding fluid from said recess into said grooves.

DALE KLEIST.