Dec. 10, 1940. E. J. FISHER 2,224,149

APPARATUS FOR COATING STRANDS

Filed April 1, 1938

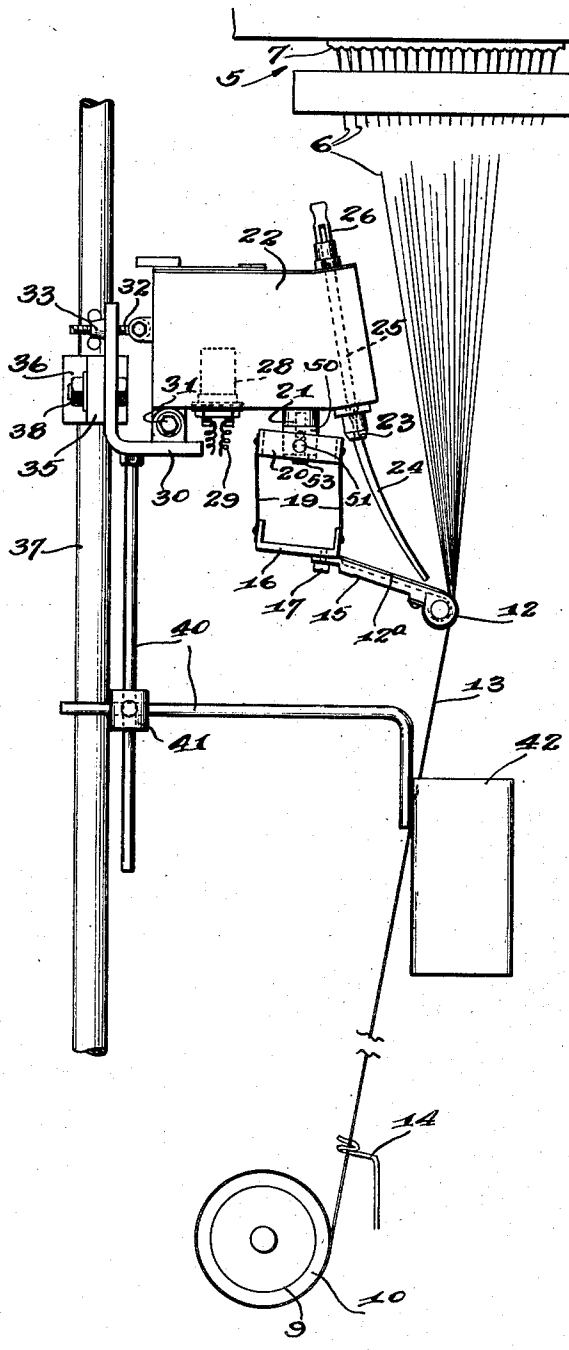

Fig. 1.

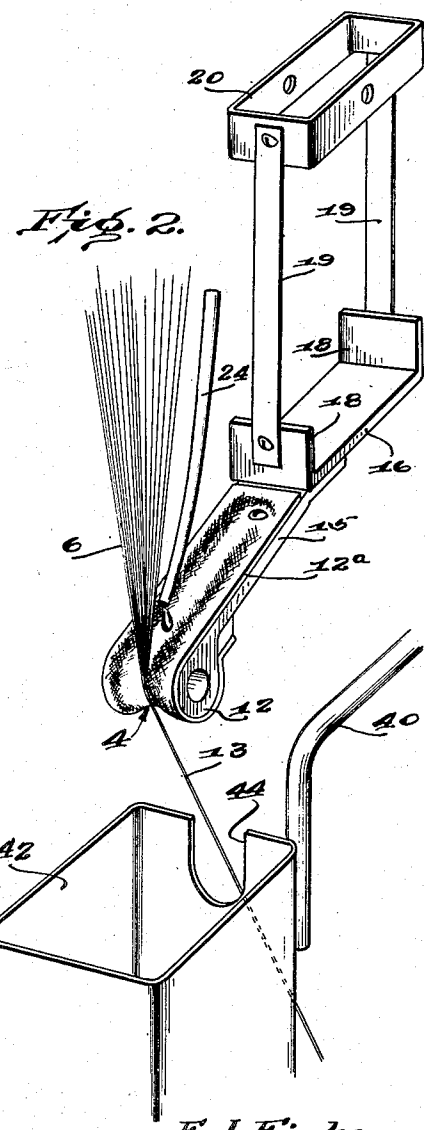

Fig. 2.

E. J. Fisher
INVENTOR.

BY Rule & Hoge
ATTORNEYS.

Patented Dec. 10, 1940

2,224,149

UNITED STATES PATENT OFFICE

2,224,149

APPARATUS FOR COATING STRANDS

Edwin J. Fisher, Kirkersville, Ohio, assignor, by mesne assignments, to Owens-Corning Fiberglas Corporation, a corporation of Delaware

Application April 1, 1938, Serial No. 199,499

7 Claims. (Cl. 91—38)

The present invention relates to a novel apparatus for applying a coating material to a multiplicity of glass filaments which have been mechanically drawn and are being grouped in the form of a strand suitable for textile or other purposes. The coating may serve for lubrication purposes to prevent filaments within the strand from scratching each other, and it may also serve for binding or sizing purposes to give mass integrity to the group of filaments in strand form, and to prevent loose ends from fraying or breaking apart from the strands.

In the mechanical drawing method of producing substantially endless filaments of glass having extremely fine diameters, as, for example, of the order of magnitude of about .0002 inch in diameter, more or less, of course, as desired, extremely high rates of attenuation are desired. This speed of attenuation has been found to be limited not so much by the speeds at which the individual filaments could be produced, that is, the filamentizing process per se, but by the speed at which the filaments could be grouped together and coated to produce a usable strand. When specially high speeds of attenuation are being utilized, as, for example, over about 5,000 feet per minute and preferably greater speeds, as, for example, about 10,000 or more feet per minute, the friction caused by the sizing process upon the tiny filaments has proved to be excessive so that many of them break and production is halted.

Moreover, when the strands which were produced had their sizing removed, as, for example, in a suitable solvent for the particular coating material applied, it was noted that the filaments in the strand broke apart at intervals along the length of the strand, some of the filaments bowing out more than others, indicating that actually the filaments were of unequal length. This produced an unbalanced condition in the strand which fostered breakage and fraying during subsequent manipulation, and in general led to a reduction in strength and quality of the finished product.

The present invention aims to overcome the aforementioned difficulties and to produce a strand having uniformly attenuated filaments which will normally lie adjacent one another in a coherent balanced strand.

It is another object of the invention to satisfactorily apply a coating to the individual filaments moving at speeds of attenuation heretofore impossible.

It is still another object of the invention to reduce the amount of friction caused by the grouping and/or sizing operation and to prevent friction from acting unequally upon the individual filaments within the strand.

An ancillary object of the invention is to provide a strand which has substantially no broken ends, and which may be packaged on a spool without difficulty, and from which spool the strand may readily be unwound.

Another object of the present invention is to smooth out the jerks in the drawing process caused by the traversing of the strand as it is wound on a package and to permit the strand to remain in the center of the groove or other concave section of the sizing guide.

Other objects and advantages of the present invention will become apparent from the following description taken in conjunction with the drawing, in which:

Fig. 1 is an elevational view of my novel sizing apparatus, shown in connection with a filamentizing apparatus and a packaging spool, the last two elements being illustrated more or less diagrammatically; and

Fig. 2 is a fragmentary perspective view of my novel sizing apparatus.

The present invention is based in part upon the discovery that by providing yieldability to the guide which serves to group the filaments into a strand and apply a coating substance, the above mentioned difficulties encountered with the grouping and sizing operation may be eliminated. I have discovered that, for some reason yet incompletely explained, the imperfections in the strand and tendency of the fibers to break apart when the sizing material is removed, as noted hereinabove, is not encountered when the gathering guide is mounted upon a spring or other suitable means permitting the eye to yield under slightly increased pressure. Moreover, with the guide thus yieldingly mounted, the speed of attenuation of the fibers may be materially increased and the strands produced thereby have increased uniformity and quality and may be readily unwound from the package without fraying or snarling.

Referring now more particularly to the drawing, reference character 5 designates broadly a filamentizing apparatus wherein a multiplicity of individual filaments 6 are simultaneously being supplied continually from a single source such as a feeder 7 or other supply means and are being drawn and attenuated by means of a revolving spool or drum 9 on which the fibers are wound to form a package 10 thereon. A blower 11 which

may be provided in proximity to the feeder 1, is adapted to chill the glass as it emerges from the feeder, although the present invention is not limited to any particular filamentizing apparatus.

The filaments 6 as they emerge from the filamentizing apparatus 5 are grouped together and drawn over a concave guide 12 in the form of a groove or eye which serves to size the filaments and simultaneously group them into a strand 13. In being drawn over the guide 12, the filaments are preferably turned through as small an angle as possible in order to reduce to a minimum the amount of force exerted by the strand upon the guide and the resultant friction. The strand 13 may then be traversed by means of traverse 14 which assists in the formation of the package 10 upon the drum or spool 9.

The gathering and lubrication guide 12 is preferably made from a very light metal, such as aluminum, in order to keep its inertia as low as possible. The free end of the guide is provided with a groove 4 (see Fig. 2) having a rounded outer surface which may be covered by means of a pad 12^a composed of suitable porous material such as a felt, muslin, sponge, cloth, or the like. The upper portion 15 of the guide 12 is in the form of an inclined trough upon which the coating substance may be fed and introduced to the groove 4 over which the filaments are drawn. The guide 12 may be fastened to a support 16 by means of a screw 17 or the like. The support 16 is preferably provided with two upstanding flanges 18, one at each end thereof, and each secured to and suspended from yielding means 19 which are preferably in the form of flexible metal tapes, composed, for example, of spring steel or the like. The upper ends of the tapes 19 may be secured to an upper support 20 having dimensions comparable to the lower support 16, whereby supports 16 and 20 and the tapes 19 define a parallelogram which gives approximately straight line motion to the guide 12 as it is moved by the strand 13. The upper support 20 may be mounted upon a lug 50 by means of set screws 51. In order to permit pivoting of the system under the influence of the traversing movement of the strand 13, the lug 50 may be pivotally secured to a bushing 21 which is located at the bottom of a sizing container 22. A bolt 53 may be provided to hold the lug in place and permit the same to pivot in relation to the container 22.

The container 22 is provided with an outlet orifice 23 through which sizing material may be fed. A conduit 24 communicates with the outlet 23 and serves to convey the sizing material to the guide 12 by gravitational means. An adjusting needle 25 fits into the orifice 23 and may be placed in any desired vertical position by means of an adjusting pin 26, similar in design to a conventional oil dripper.

Arranged preferably in the lower portion of the container 22 is a heating means 28, such as an immersion type heater using electrical energy supplied through the electrical connections 29.

The container 22 may be adjustably mounted upon a suitable elbow 30 to which it is pivotally attached for tilting movement by means of a pivot bolt 31. The container is held in any desired position of adjustment by means of a screw rod 32 and wing nut 33.

The elbow 30 in turn may be mounted upon one end of an arm 35 having a collar 36 at the opposite end thereof, fitting around a vertical supporting rod 37. The collar 36 may swing around on the rod 37 and be held in adjusted position by means of the bolt and nut 38.

Depending from the elbow 30 is a system of rods 40 having an adjustable connection 41. Supported at the free end thereof is a cup 42 which is spaced below the guide 12 to receive any surplus drippings of sizing material which may fall from the guide 12. As shown in Fig. 2, the cup may be provided with an opening 44 through which the strand 13 may pass without touching the sides of the cup. When not in operation the cup may be swung about the connection 41 out of the path of the strand 13.

In operation of the present device, a suitable coating material such as wax, animal, vegetable or mineral oils, starch, agar agar, fats, sulphonated oils, bitumens, fatty acids, alcohols, glue, esters, gluten, soaps, pectin, rubber, latex, varnish, shellac, resins, plastics, cellulose compounds, cellulose derivatives, or combinations thereof, whether in molten condition, solution form, or in the form of an emulsion, may be held in the container 22, heated to the desired temperature by means of the heater 28, and fed through the orifice 23 and through the conduit 24 to the guide 12. The pad 12^a may be saturated with the coating material, especially the groove 4 around which the filaments 6 are drawn. The filaments in being drawn over the pad 12^a are lubricated by the liquid coating material and are simultaneously coated thereby. In traveling from the guide 12 to the package 10, the coating material may be sufficiently solidified that it will not cause the adjacent strands upon the package to adhere to one another. However, when such substances as oils, thin solutions or emulsions are applied, the coating may remain substantially in a fluid or slightly viscous condition on the package which, however, does not prevent the strand from being unwound.

Should any filament 6 break during its attenuation, an operator may restart the stream flow by means of a bait or the like and after a preliminary attenuation may draw the filament adjacent the others across the groove 4, and as it takes on its allotment of coating material, it joins with the other filaments in the strand and passes on into the package automatically.

It is to be observed that in the process of coating, the guide 12 is supported yieldingly by means of the flexible tapes 19 so that when the strand 13 is subjected to any unusual stresses or irregular pulling forces, even of minute magnitude, the guide 12 will yield, maintaining a substantially uniform friction and force against the strand. Moreover, as the strand is traversed back and forth by the traverse 14, the guide 12 is permitted to follow the sideway movements by oscillating around the axis of the bolt 53, and thus any jerking movements emanating from the packaging process are smoothed out and dissipated. This arrangement has been found to materially assist in the efficiency of the sizing operation.

Various modifications and variations may be resorted to within the spirit and scope of the present invention as defined in the appended claims.

I claim:

1. Means for grouping a multiplicity of individual glass filaments in strand form as they are continuously being attentuated, which comprises a light weight, concave guide over which said individual filaments are drawn and over which they converge into strand form, means for feeding a coating substance to said guide for ap-

plication to said strand and yielding means for supporting said guide and permitting said guide to yield with sensitivity in a direction transverse to the movement of said strand under varying stresses in said strand.

2. Apparatus for simultaneously grouping and sizing a multiplicity of long glass filaments as they are being attenuated which comprises a concave guide over which said filaments are drawn and by which they are grouped into strand form, a spring upon which said guide is mounted serving to permt yieldability of said guide under varying stresses in said strands, and means for applying a sizing material to said guide for coating the filaments as they are drawn thereover.

3. Apparatus for sizing a multiplicity of glass filaments simultaneously as they are being grouped into strand form, which comprises a guide over which said filaments are drawn, means for supplying a coating material to said guide, and means for yieldingly supporting said guide to permit sensitive retraction of said guide under the influence of irregular stresses in said strand.

4. Apparatus for sizing a multiplicity of glass filaments simultaneously as they are being grouped into strand form which comprises a guide having a groove therein over which said filaments are drawn, means for supplying a coating material to the surface of said guide and permitting the same to coat said filaments, and means for supporting said guide, said means comprising flexible metal tapes upon which said guide is suspended.

5. Apparatus for sizing a multiplicity of glass filaments simultaneously as they are being grouped into strand form which comprises a guide having a groove therein over which said filaments are drawn, means for supplying a coating material to the surface of said guide and permitting the same to coat said filaments, and means for supporting said guide, said means comprisng at least two flexible metal tapes spaced apart from one another and arranged substantially parallel to one another, upon which said guide is suspended, said tapes adapted to permit substantially straight line retractive movement of said guide as irregular stresses are induced in said strand.

6. Apparatus for sizing a multiplicity of glass filaments after they have been attenuated and while they are being grouped into strand form, which comprises a guide having a groove at the free end thereof over which said filaments are drawn into strand form, a pad over said groove capable of being saturated with a coating material, means for supplying coating material to said pad, and a spring upon which said guide is mounted to permit sensitive yieldability of said guide under the stresses present in said strands.

7. Apparatus for simultaneously grouping and sizing a multiplicity of long glass filaments as they are being attenuated, which comprises a concave guide over which said filaments are drawn and by which they are grouped into strand form, a spring upon which said guide is mounted serving to permit yieldability of said guide under varying stresses in said strand, means for permitting said guide to move transversely to the direction of travel of said strand to compensate for lateral movements or traversing of said strand, and means for applying a sizing material to said guide for coating the filaments as they are drawn thereover.

EDWIN J. FISHER.