

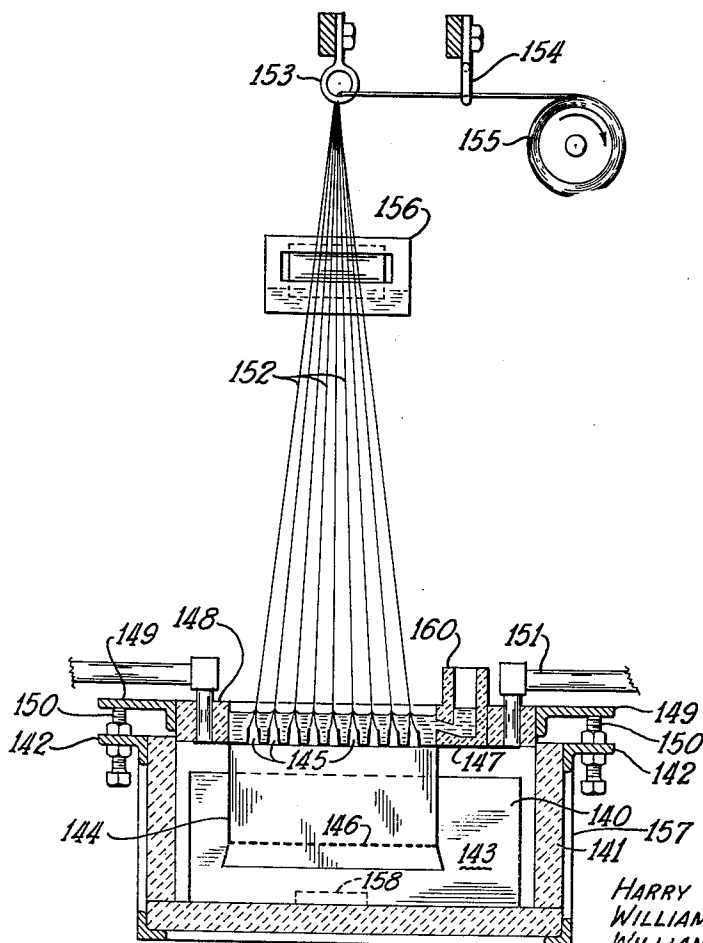
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METHOD AND APPARATUS FOR METAL COATING GLASS FILAMENTS

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METHOD AND APPARATUS FOR METAL COATING GLASS FILAMENTS

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This is a continuation in part of application Serial No. 399,239 filed on December 21, 1953, and now Patent No. 2,980,956 in the names of the present inventors.

This invention relates to apparatus for the production of metal-coated glass fibers and more particularly to novel applicators for applying metal coatings to glass fibers in high speed fiber-forming operations.

The coating of glass fibers with metal such as zinc, aluminum, tin, lead and alloys of such metals such as zinc aluminum alloys, has been found highly advantageous in offering protection to the wear sensitive surfaces of the glass fibers and in facilitating their adaptability to a working use for strength purposes such as in strands, yarns, cords, ropes, fabrics and other textile products as well as products such as fibrous mat, wool, and structural boards. It has also been found in the practical aspects of manufacturing metal-coated glass fibers that economy of production is greatly enhanced when the metal is applied to the fibers directly in the fiber-forming process, thereby eliminating the need for extra handling of fibers for the coating operation. A method and apparatus adapted to application of metal to glass fibers in this manner has been described in a copending application, Serial Number 322,598, filed on November 26, 1952, entitled "Metal Applicators for Glass Filaments."

In each of the various embodiments described in the above application, the accumulation of molten metal through which the fibers are drawn is suspended under its own surface tension upon emission from an orifice of a supply source located to one side of the filaments. As higher and higher speeds are resorted to in the production of metal-coated fibers in this manner, however, vibration of the fibers or filaments by reason of winding operations or extraneous motions and forces often creates an instability at the point of application of molten metal to the fibers, causing non-uniform distribution of metal in the coating and resulting in inconsistencies in the desirable characteristics of fibers so coated.

Accordingly, it is an object of the present invention to provide a method and means for continuously applying metal to glass fibers during fiber-formation which permit stable high speed production with a minimization of non-uniformities in the final product and discontinuities in fiber-forming operations.

Another object of the invention is to provide an improved method and means for applying metal to glass fibers without deleteriously affecting the desired physical properties obtainable in such fibers.

Still another object of the present invention is to provide an improved method of applying metal to glass filaments during fiber-forming operations with the assurance that a thoroughness of coating will be provided with a minimum of manual control or supervision of operations.

A further object of the invention is to provide a method and means for producing metal-coated glass fibers adaptable to existing glass fiber-forming operations and equipment with a wide sensitivity tolerance to minimize the need for regulation of coating operations.

In the embodiment herein disclosed, the application of metal to fibers is geared to application of metal at ex-

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tremely high speeds corresponding to rates at which fibers may be formed in conventional processes such as when streams of molten glass supplied from feeder orifices in a source of molten glass are attenuated into fibers of small diameter.

According to the principles of this invention, the glass fibers or filaments are coated with molten metal by engulfing each individual fiber with molten metal accumulations through which the fibers are drawn.

A feature of the invention lies in the fact that the applicators disclosed feed molten metal in a manner which assures a thorough envelopment of the fibers.

Other objects and features which we believe to be characteristic of our invention are set forth with particularity in the appended claims. Our invention, however, both in organization and manner of construction together with further objects and advantages thereof may be best understood by reference to the following description taken in connection with the accompanying drawings in which the FIGURE is a side elevational view of a fiber-forming and metal-coating unit for producing metal-coated glass fibers by a forming process in which the fibers are attenuated upwardly.

Turning to the drawing in detail the figure shows apparatus for producing metal coated fibers. In this arrangement, a body of glass 140 in a container 141 is supported by an outer shell or framework 157. Opposite sides of the interior of the container are lined with platinum or other suitable electrodes 143 adapted to melt the glass and maintain it at proper temperature. This apparatus is similar to that set out in Patent 2,225,667 issued to Carl G. Staelin on December 24, 1940.

Electrical leads 158 are connected to the electrodes to provide the desired heat. In the center of the container is a melter 144 made of platinum, platinum alloy, or other suitable material, which is log cabin in shape, being open at the bottom to admit the molten glass from the exterior thereof, and terminating at the top in a plurality of openings 145 at which the molten glass may be exposed. Screens 146 are provided across and at the bottom of the melter 144 in order to prevent stones, unmelted batch and other foreign matter from entering into the melter. Across the surface of the glass and constructed preferably integral with the melter 144 is a surface plate 147 through which the nipple-type openings 145 extend. Overlying the surface plate 147 is a refractory block 148 which serves to insulate the surface plate and also to hold the melter in position. Fastened to the refractory at opposite sides thereof are brackets 149 which are fastened by adjustable connection 150 comprising adjustable bolts and nuts or other suitable means which may be fastened to the outer casing of the framework 157. By regulating connections 150, it is possible to adjust the height of the melter 144 and openings 145 in relation to the surface of the body 140 of molten glass.

In order to maintain the temperature of the glass at the openings 145 within accurate limits, it has been found desirable to provide electrical connections 151 at opposite ends of the surface plate 147.

The fibers 152 are drawn upwardly from the openings 145 through an eye 153 which collects the fibers into a strand. After passing through the eye 153 the fibers are drawn through a traversing eye 154 to be wound over a suitable spool or the like on a revolving drum 155.

Metal is applied to the glass fibers by providing it in the form of a pool in molten condition supplied from a container portion 160 and distributed over the openings 145 in the surface plate 147. The plate 147 acts to maintain the metal in molten condition by reason of the heat generated therein by electrical current passing there-through. The openings 145 are sufficiently small that the molten metal will not pass downwardly therethrough,

while glass may be drawn up therefrom and through the metal for a coating. Before being gathered at the eye 153, the metal-coated fibers are approximately at room temperature and may be gathered without fear of damage to the fiber. Sizing material may be applied to the fibers by suitable size-applicating means such as a shoe or pad 156 making engagement with the fibers at a point below the gathering eye 153.

Metal-coated glass in the massive form or in the form of fibers, strands, yarns and like textile products produced by the apparatus and methods of the invention may be used in many products including the following: mirrors; reflecting surfaces; decorative materials; decorative fabrics; tapes; fishing lines; awnings; upholstery material; roofs; reinforced resins; movie screens; clothing; clutch facings; reinforcing cords for rubber products; including tires, garden hose, fire hose, conveyor belts, blankets, fan belts, motor belts, erasers, rug paddings, gloves, oxidizable material in flash bulbs, conductors in electrical circuits, radio, television and electronic equipment, radiation shields, protective wrappings in the form of foil or fabric, laminated products comprising thin foils of glass and metal, heating elements and resinous table tops and the like and many more.

While we have shown certain particular forms of our invention, it will be understood that we do not wish to be limited thereto since many modifications may be made within the concepts of the invention and we, therefore, contemplate by the appended claims to cover all such modifications which fall within the true spirit and scope of our invention.

We claim:

1. Apparatus for producing continuous coated fibers of heat softened material comprising a container maintaining a supply of heat softened fiber forming material, said container having an orificed feeder surface disposed above the container supply of fiber forming material, means maintaining a molten pool of fiber coating material completely exposed to the atmosphere supported on said feeder surface, and means for attenuating said fiber forming material upwardly into and through said pool of fiber coating material in the form of continuous coated fibers.

2. Apparatus for producing coated glass fibers comprising in combination a container for molten glass having an overlying surface with outlet openings through which glass from the container can be drawn upwardly as streams, an open top container associated with said glass container for supporting molten coating material in exposed relation to the atmosphere, said overlying surface forming the bottom of said open top container, and means for attenuating the streams of glass upwardly from

said outlet openings through the coating material in said open top container to form coated glass fibers.

3. Apparatus for producing coated mineral fibers comprising in combination a container for molten mineral material having an overlying surface with outlet openings through which the mineral material from the container can be drawn as streams, an open top container for supporting molten coating material in exposed relation to the atmosphere, the overlying surface of said glass container being disposed immediately under and forming the bottom of said open top container such that streams of mineral material passed through said outlet openings can be drawn freely through the coating material supported thereon, and means for attenuating the streams of mineral material and coating material upwardly into the form of coated mineral fibers.

4. Apparatus for producing coated mineral fibers comprising in combination a container for molten mineral material having outlet openings in an overlying surface through which mineral material from the container can be drawn upwardly as viscous streams, a container for molten coating material for which said overlying surface forms a bottom, said coating material container having an open top such that said coating material is supported therein in exposed relation to the atmosphere, said coating material container also being adapted to containing a depth and temperature of molten coating material such that streams of the mineral material drawn upwardly through said coating container will receive a coating of said coating material, and means for attenuating the streams of mineral material and coating material into coated mineral fibers.

5. A method for forming continuous coated fibers comprising maintaining a relatively fixed open pool of heat softened coating material exposed to the atmosphere in immediate overlying partitioned relation above a viscous quantity of heat softened fiber forming material, drawing quantities of said fiber forming material upward in the form of streams into said contained open pool of coating material, contacting said streams with said coating material and applying a coat thereof to said streams and continuously attenuating said coated streams upwardly through said pool of coating material and from the exposed surface thereof as continuous coated fibers.

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