May 8, 1962 C. J. STALEGO 3,032,813

APPARATUS FOR FORMING AND PROCESSING CONTINUOUS FILAMENTS

Filed July 9, 1957

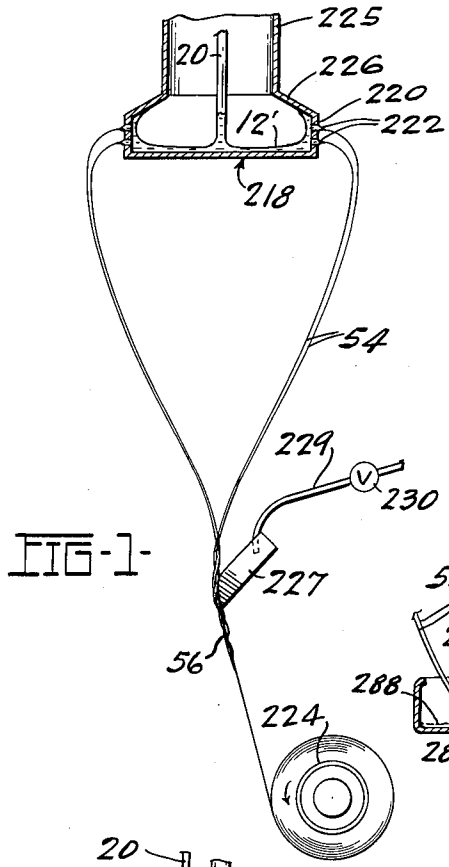


FIG-1-

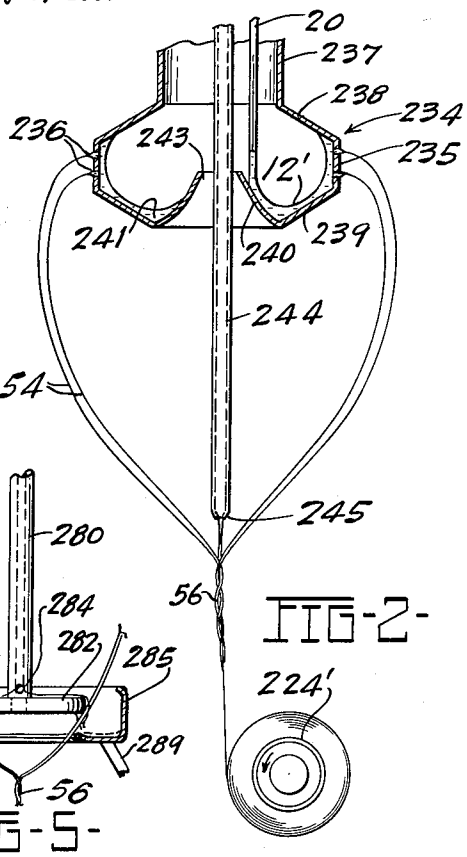


FIG-2-

FIG-5-

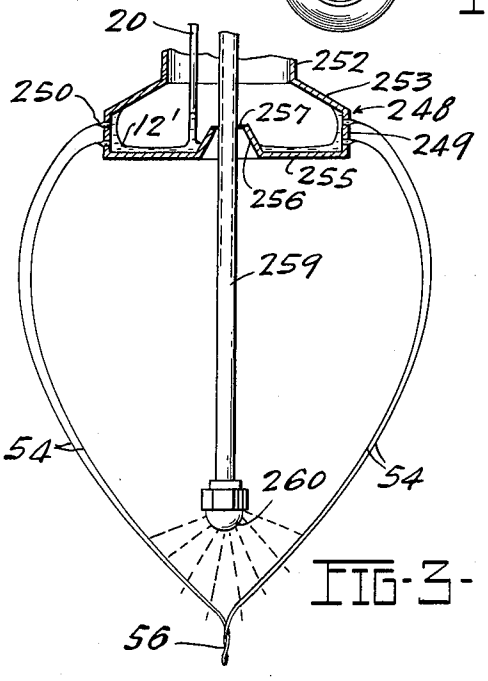


FIG-3-

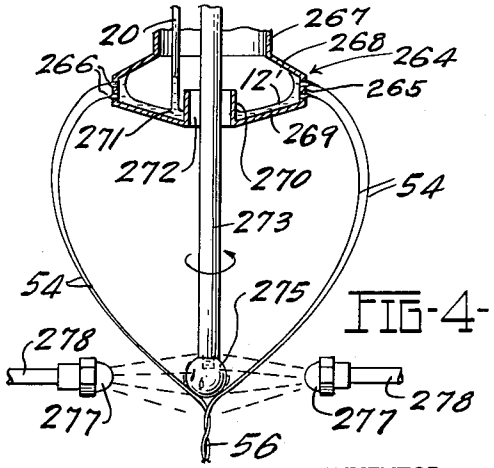


FIG-4-

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APPARATUS FOR FORMING AND PROCESSING CONTINUOUS FILAMENTS

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2 Claims. (Cl. 18—8)

This invention relates to method of and apparatus for forming and processing fibers or filaments and more especially to the formation of continuous fine filaments formed of glass or other heat-softenable material and processing the continuous filaments into twisted slivers threads, yarns, rovings, mats, fibrous packs and other end products formed therefrom.

Various methods have been employed heretofore in forming and processing filaments into threads, yarns, or the like, by drawing or attenuating the filaments into a group or sliver collected on a drum, spool or the like and the collected sliver subsequently twisted per se or twisted with other groups of filaments to form threads, rovings, yarns or other textile formations. Furthermore mats of continuous filaments have heretofore been unsatisfactory because of difficulties encountered in collecting the filaments.

The present invention embraces the provision of apparatus for forming continuous filaments from glass streams or streams of other heat-softened mineral materials wherein the streams are rotated, which rotation is effective to twist the continuous filaments or fibers into a twisted sliver, thread or yarn as the continuous filaments or fibers are being formed from the streams.

An object of the invention is the provision of a method of and apparatus for spinning continuous filaments from a rotor containing a body of heat-softened mineral material, such as glass, applying a lubricant, binder or coating material to the continuous filaments and twisting the coated filaments into a strand, thread or yarn as the filaments move away from the spinning zone.

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 illustrates a form of rotor construction and a means for delivering binder or coating material onto the filaments;

FIGURE 2 illustrates a modified form of rotor construction and an applicator for delivering binder or coating material onto the continuous filaments;

FIGURE 3 illustrates another form of rotor construction and means for delivering binder or coating material onto the filaments;

FIGURE 4 illustrates another form of rotor construction and means for delivering binder or coating material onto the filaments, and

FIGURE 5 illustrates another arrangement for applying binder or coating material onto continuous filaments.

The method and apparatus of the invention are especially adaptable and usable for forming continuous filaments or fibers of glass and processing the filaments into products, such as twisted strands, threads or yarns, or forming packs or mats of the filaments, but it is to be understood that the invention may be utilized for forming filaments from other heat-softenable materials, such as slog, rock or resins, and for processing filaments of such materials into various end products.

Referring to FIGURE 1, the rotor 218 is formed with

a vertically disposed cylindrical wall 220 provided with orifices or hollow tips 222 through which the filament-forming material 12' such as heat-softened glass within the rotor is projected and the projected bodies of glass attenuated to continuous filaments 54 by being wound upon a sleeve or collet 224. The rotor 218 is formed with a hollow shaft portion 225 which is rotated by suitable means (not shown) and which is joined with the vertical wall portion 220 by a frusto-conically shaped surface 226. The glass stream 20 is introduced into the rotor through the hollow shaft portion 225.

The filaments 54 are rotated by the rotor 218 and hence are continuously twisted together to form a twisted sliver or thread 56 which is collected on the sleeve or collet 224. The amount of twist imparted to the bundle, group or sliver 56 is dependent upon the linear rate of attenuation of the filaments, that is, the rate in linear feet in a given time wound upon the sleeve 224 in proportion to the number of revolutions of the rotor 218 in the same length of time.

An applicator member 227, preferably disposed adjacent the region of the juncture of the filaments into a sliver or bundle 56, is arranged to be engaged by the sliver of continuous filaments. The member 227 may be a felt pad, a graphite pad or a rotatable roller to which a binder, lubricant or other coating material is delivered from a supply by means of a tube 229. A valve 230 is provided for regulating the rate of delivery of coating material to the applicator 227. The sliver or group of continuous filaments acquires the coating material by the wiping action effected through contact with the applicator 227.

The filament coating means shown in FIGURE 1 may be employed for coating filaments formed from other rotor constructions illustrated in the drawings, the particular coating applied to the filaments depending upon the purpose for which the same are to be utilized.

FIGURE 2 illustrates another form of rotor construction and a modified arrangement for applying a lubricant, binder or other coating material onto the sliver or group of continuous filaments. The rotor 234 is of hollow configuration having a vertically arranged cylindrical wall 235 provided with orifices or hollow tips 236 through which the glass or other filament-forming material 12' within the rotor is discharged under the influence of centrifugal forces set up by rotation of the rotor. The rotor is inclusive of a hollow shaft portion 237 which is joined to the vertical peripheral wall 235 by a frusto-conically shaped surface 238.

The bottom wall of the rotor is inclusive of a downwardly inclined inwardly extending frusto-conical wall portion 239 joined with an upwardly and inwardly extending frusto-conical wall portion 240. The heat-softened glass or other filament-forming material is delivered through the hollow shaft portion 237 into the annular trough 241 provided by the convergence of the frusto-conically shaped surfaces 239 and 240. The upper edge region of the surface 240 defines an opening 243 through which extends a tubular member or pipe 244, the lower end 245 of which is disposed adjacent the juncture of the continuous filaments 54 at which region they are twisted by the rotation of the rotor. The group of twisted filaments 56 may be collected by winding same upon a rotating collet or sleeve 224'.

The stream of glass 20 is directed into the hollow rotor out of alignment with the axis of rotation in order that the glass may be diverted by the conically-shaped wall 240 into the annular trough-like configuration 241. The tube 244 is connected with a supply of lubricant, binder or other coating material which is delivered onto the continuous filaments 54.

FIGURE 3 is illustrative of a modified form of rotor construction and shows another method and arrangement

for delivering lubricant, binder or other coating material onto the continuous filaments 54. In this arrangement a rotor 248 is provided with a cylindrical wall 249 provided with orifices or hollow tips 250 through which softened glass 12' within the rotor is projected and attenuated to continuous filaments 54 which are twisted together to form a twisted sliver or filament group 56 by rotation of the rotor.

The rotor is fashioned with a hollow shaft portion 252 joined by a frusto-conically shaped surface 253 with the circular peripheral surface 249. The bottom wall 255 of the rotor is joined with a centrally arranged upwardly extending cone-shaped portion 256. The upper edge region of the portion 256 defines an opening 257 through which extends a tubular member or pipe 259 equipped at its lower end with a spray nozzle or applicator 260. The tube 259 is connected with a reservoir or source or supply of lubricant, binder or other coating material. The filament coating material may be delivered by the nozzle 260 under air or gas pressure and thereby atomized to form small particles or globules which readily collect upon or cling to the continuous filaments 54.

In the method performed by the arrangement shown in FIGURE 3, the lubricant, binder or coating material is delivered onto the continuous filaments while they are still in an isolated state so that they become adequately and completely coated before or concomitantly with their formation into a twisted sliver or group 56, the twist being imparted to the sliver or group through the rotation of the rotor.

The stream 20 of glass or other filament-forming material is delivered through the hollow shaft portion 252 at a region spaced from the axis of the rotor and from the opening 257 in order that the material will not pass through the opening but is directed outwardly into contact with the inner surface of the peripheral wall 249 by centrifugal forces providing an ample supply of the filament-forming material at the wall 249.

FIGURE 4 is illustrative of another method and arrangement for delivering lubricant, binder or other coating material onto the continuous filaments 54. The rotor 264 which is of hollow construction is formed with a circular cylindrical wall 265 provided with orifices or hollow tips 266 through which the filament-forming material 12' within the rotor is projected by centrifugal forces of rotation. The rotor is fashioned with a hollow shaft portion 267 which is joined with the circular peripheral wall 265 by a frusto-conically shaped wall portion 268. The bottom wall 269 of the rotor extends downwardly and inwardly and joins an upwardly projecting sleeve-like portion 270. The stream 20 of glass is delivered through the hollow shaft portion 267 into an annular trough-like configuration 271 provided by the bottom wall 269 and the upwardly extending sleeve portion 270.

The sleeve 270 is of a diameter defining a passage 272 through which extends a rod, shaft or tube 273 equipped at its lower terminus with a spherically shaped member or ball 275.

The shaft 273 and ball member 275 may be rotated with the rotor 264 or independently thereof. The lubricant, binder or other coating material conveyed from a supply by pipes 278 is delivered from applicators or nozzles 277, preferably in the form of a spray directed toward the peripheral surface of the ball 275. The continuous filaments receive coating material from the spray and also contact the surface of the ball 275 and wipe coating material from the ball whereby the individual filaments are completely coated adjacent the region at which they are gathered into a sliver or group 56 and a twist imparted thereto through the rotation of the rotor 264.

The sliver or filament group 56 is directed to a rotating collet or sleeve similar to the sleeve 224' upon which the twisted sliver is wound, the winding attenuating the glass into continuous filaments 54. While two applicators 277 are illustrated in FIGURE 4, it is to be understood that any number of applicators may be utilized if desired.

FIGURE 5 illustrates another method and arrangement for delivering lubricant, binder or coating material onto the continuous filaments or fibers which is usable with the forms of rotor provided with a central opening to accommodate a tube for the coating material to be applied to the filaments. The arrangement includes a tube 280 which is provided at its lower extremity with a circular disk, table or platform 282. The wall of the tube 280 adjacent the upper surface 283 of the platform 282 is formed with a plurality of orifices 284, one of which is shown in FIGURE 5.

The lubricant, binder or coating materials flow from a source of supply through the tube 280, and through the openings or outlets 284 onto the surface 283 of the platform. The tube 280 extends through an opening formed in the central region of a bottom wall of a rotor with which the arrangement may be used and is connected with a supply of coating material to be applied to the continuous filaments 54.

Surrounding the table or platform 282 is an annular member 285 formed with an inner upwardly extending flange 286 providing an annular trough or chamber 288 for collecting excess binder which flows over the peripheral surface of the table 282 and is conveyed away by means of a tube 289 for reuse. The filaments 54 during their downward travel wipe the coating material from the edge surface of the disk or table 282 and thereby acquire a film of the coating material. Coating material which does not adhere to the filaments passes into the trough 288.

The disk or table 282 is of a diameter such that all of the continuous filaments 54 brush against or contact the coating on the peripheral surface of the disk or table so that each filament acquires a coating of material. The coated filaments are joined in a group or sliver 56 which is twisted under the influence of rotation of the rotor from which the filaments are attenuated as in the arrangements hereinbefore described.

The disk or platform 282 is preferably formed of graphite, rubber or the like to minimize wear of the edge region of the disk. If the coating material is of a comparatively high viscosity, the continuous filaments 54 may acquire a film of the coating material without contact with the disk.

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 forming and processing continuous filaments from heat-softened material, in combination, a support, a hollow rotor journaled upon the support and adapted to contain heat-softened filament-forming material, means for rotating the rotor, said rotor being shaped to discharge the heat-softened material in a plurality of streams, means for attenuating the discharged material into continuous filaments and converging the filaments into a linear group, said linear group of filaments being twisted by rotation of the rotor, means for applying a coating material onto the filaments including a tube extending through the rotor, a member carried by the tube, said tube being arranged to convey a coating material from a supply onto the member, said continuous filaments moving in a path whereby the filaments contact the coating material on the member and acquire a film of coating, and means associated with said member arranged to convey away excess coating material.

2. Apparatus for forming and processing continuous filaments from heat-softened material, in combination, a support, a hollow rotor journaled upon the support and adapted to contain heat-softened filament-forming material, means for rotating the rotor, said rotor having a wall formed with orifices through which the material is discharged, means for attenuating the discharged

material into continuous filaments and converging the filaments into a linear group, said linear group of filaments being twisted by rotation of the rotor, means for applying a coating material onto the filaments including a rotatable member disposed axially of the rotor, an element supported on said member and disposed whereby the filaments contact the element adjacent their zone of convergence into a linear group, means for continuously delivering coating material onto the element, said moving filaments wiping the coating material from the element thereby to acquire a film of the coating material.

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