Method of winding thin threads or filaments

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Fig. 1

Fig. 2

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This invention relates to the production of threads or filaments of glass or substances having properties similar to those of glass and has for its object to provide an improved method of winding such threads or filaments on a drum or spool whereby the disadvantages connected with existing methods are avoided.

The difficulties which have to be overcome when winding threads or filaments upon a spool, particularly during the spinning of glass threads, are due to the high circumferential speeds used in operation, because the action of centrifugal force and, to an even greater extent, the action of the air displaced by the rotation, render it difficult to apply the threads to the spool. For eliminating these influences it has been proposed to employ drums in the interior of which sub-atmospheric pressure prevails whereby the filaments are drawn towards the spool by suction. This proposition, as well as another according to which the filaments are wetted or rendered sticky or other known complicated methods involve expensive equipment and require much space and in particular involve the employment of large drums which cannot be mounted on the usual yarn making and twisting machines and therefore render rewinding necessary prior to this operation.

The method according to the invention enables filaments to be wound in a much simpler and effective manner. The method consists in effecting the winding within a layer of air separated from the outside air by a shell or jacket which is substantially concentric to the spool, said layer of air thus being protected from the disturbing influences of the outside air and also of the air accelerated by the end surfaces of the spool. In this layer of air currents and variations of the intensity of the static pressure conditions are created. The velocity of the air current carried along by the spool in the direction of rotation is reduced in a direction from the spool surface towards the stationary shell or jacket and at the same time the static pressures in the same direction increase. A body introduced into this air current is, owing to the pressure differences acting in the direction of the radius of the spool upon its surface, subjected to forces which tend to guide it towards the spool. This action is particularly strong in the case of threads or filaments, especially glass filaments, because they have a very great surface area relative to their mass.

Preferably, within the space bounded by the shell or jacket, the filament is guided through a zone of reduced cross section, in which an increased reduction of the static pressure in the direction of the spool surface tends to draw the filament to the cylindrical surface of the spool against the action of the centrifugal force.

It is particularly advantageous to cause additional outside air to enter through the openings provided in the stationary shell or jacket, which is conveniently made of smooth sheet metal without projections to prevent turbulence in the air layer, into the air current moving between the spool and the shell or jacket, thereby producing a direct air stream in the interspace for drawing the filament to a still greater extent towards the spool.

The principle underlying the invention having been explained above, the invention will now be more particularly described with reference to the accompanying drawing which shows by way of example one form of a device for carrying out the method described and wherein Figure 1 is a side view partly in section, of the device and Figure 2 is a front elevation thereof.

Referring to the drawing, 1 is a thread producing means comprising, in the embodiment shown, an apertured heating device 2 in which glass rods 4 are caused to melt. Through each aperture 3 a particle 5 of molten glass is discharged which draws after it a thread or filament 6. 7 is the core of a winding drum rotating at suitable speed in the direction indicated by arrow 14 and 8 are side cheeks for laterally limiting the drum and which are of such a width that they project somewhat beyond the shell or jacket 13 surrounding the spool to protect the wound glass threads from the action of the air 9 thrown off by the outsides 10 of the cheeks 8. The shell or jacket for separating the air layer carried along due to friction relative to the circumference of the drum from the outer air preferably comprises an inclined channel-like member 12, which may be constructed also for instance in such manner that the particle of molten glass is guided to the spool not only tangentially but at the same time in a radial direction, and a member 13 concentric with the core 7. The member 12 serves as receiver and collector for the particles 5 issuing from the device 1 and represents, furthermore, that portion of the device within which, according to the invention, the space between the jacket and core is reduced in cross section in the direction of rotation of the surface of the spool. The air current drawn by the spool in the direction of the arrow 15 increases in speed, so that the static pressure is
decreased. The pressure in the space between the core and jacket is lower in the member 13 than the pressure of the outer air. This difference in pressure, i.e., the directed air stream produced thereby, leads the threads toward and onto the spool or drum. In order to increase this effect the jacket 13 is provided with openings 14 through which additional air is drawn from the outside.

When a particle 6 is melted off and falls down from one of the glass rods 4, it slides along the portion 12 of the jacket and draws a thread 6 after it, and when the particle 6 and the threads 6 pass into the member 13 of the jacket, both will be moved in the direction of rotation of the spool 7 owing to the prevailing conditions of flow.

Finally, the influence of centrifugal force upon the particle and the adjacent thick portion of the thread will become preponderant owing to the large masses of the particle and thick portion and they as well as all excessively thick parts of the thread will no longer be passed along and are not wound up but will break off from the thread and be thrown out through a suitably shaped opening 17 in the jacket.

The portions of the thread wound upon the spool 7 are those upon which the action of centrifugal force is less than the drawing action of the spool, or, in other words, these portions have the proper diameter required for subsequent use.

To replace a fully wound spool a new spool 18 is simply displaced along the shaft 11 without stopping the device, and allowance is made for this in the direction of the jacket.

By the application of known methods a plurality of single threads 6a, 6b, etc., can be advantageously spun at the same time and combined by means of a guide member 18 to produce a bundle of threads that is more durable than individual threads.

What I claim and desire to secure by Letters Patent is:

1. Apparatus for winding threads of material having properties like those of glass, comprising a source of material, means to supply drops of the material moving away from the source and connected by threads of the material to the source, a rotatable spool at one side of the path of the drops, a longitudinally slitted sleeve surrounding the spool, and flanges on the ends of the spool extending into proximity to the sleeve, one of said slits being open towards said source in position to receive the drops in their movement from the supply, one slit being positioned for passage of the drops away from the spool, and other slits having their edges turned to direct air towards the spool.

2. The method of winding upon spools thin threads of material having properties similar to those of glass, which consists in shielding from the surrounding air a concentric layer of air around a spool upon which thread is to be wound, the shielding being complete at the ends of said layer but discontinuous around its circumference, rotating the spool, passing threads into said layer through the shield and into contact with the spool, winding the threads on the spool and passing air through the shield into said layer and against the threads and blowing the threads towards the spool.

3. The method of winding upon spools thin threads of material having properties similar to those of glass, which consists in shielding from the surrounding air a concentric layer of air around a spool upon which thread is to be wound, the shielding being complete at the ends of said layer but discontinuous around its circumference, rotating the spool, passing threads into said layer through the shield and into contact with the spool, winding the threads on the spool and passing air through the shield into said layer and against the threads and blowing the threads towards the spool.

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