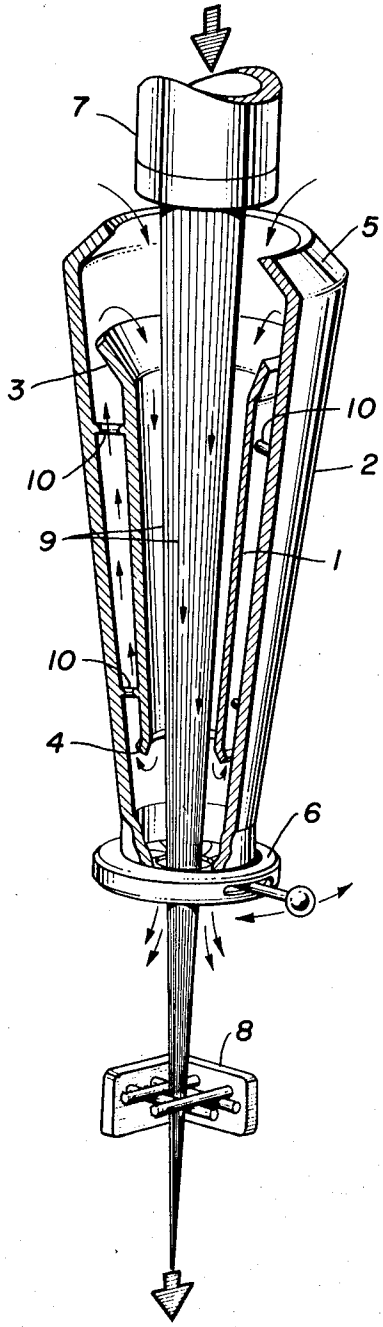
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SPINNING CHIMNEY

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SPINNING CHIMNEY

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ABSTRACT OF THE DISCLOSURE

A spinning chimney to be used for the quenching of molten polymeric filaments, said chimney having walls which converge from top to bottom and through which the filaments and a quenching medium pass downwardly, and a wall engulfing shroud extending beyond the tops and bottoms of the walls and positioned to capture at least part of the fluid which exists from the bottom of the walls and redirect same back between the walls and shroud for flow adjacent the top of the walls onto the filaments.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to the production of synthetic filaments, yarns, ribbons, and the like from fiber-forming synthetic polymers. More specifically, this invention deals with improvements in the apparatus employed in cooling the molten structures extruded from a spinneret.

(2) Description of the prior art

In practice, melt-spun filaments are extruded from a spinneret and enter a spinning chimney or quenching chamber where they are subjected to the flow of a quenching medium.

Heretofore, a number of different spinning chimneys have been known and all have suffered from various insufficiencies; being inadequate on the whole. Some have suffered because of the uneconomical volume of air or quenching medium required to attain the desired result. Others have suffered in that much of the air used is wasted; never reaching the filaments. Still others have suffered in that they are cumbersome, while yet others are structurally uneconomical and/or unsuitable.

Further, conventional spinning chimneys have required elaborate plenum arrangements in order to obtain a uniform distribution of fluid flow over the filament bundle. The equipment, such as fans, etc., associated with the plenum arrangements have proved burdensome in terms of expense, space and maintenance.

SUMMARY OF THE INVENTION

The quenching of molten polymeric filaments is accomplished through the use of a chimney having converging walls enclosed by a shroud. The quenching medium will be air at ambient conditions drawn from the room occupied by the chimney.

Accordingly, an object of this invention is to provide a simple and inexpensive spinning chimney.

Another object of this invention is to provide a spinning chimney requiring no plenum arrangement for the successful operation thereof.

Yet another object of this invention is to provide a spinning chimney requiring no positive passage of fluid over and across the filament bundle passing through the chimney.

Still another object of this invention is to provide a spinning chimney having no continuously moving parts.

These and other objects and advantages will become more readily apparent when considered in conjunction with the remainder of the specification and accompanying drawing.

BRIEF DESCRIPTION OF DRAWING

The drawing shows a perspective view, partially broken away, of the spinning chimney according to this invention along with an associated spinneret and convergence guide.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiment as shown in the drawing includes converging walls **1**, shroud **2** secured to walls **1** by means of supports **10**, means **4** and **6** associated with the bottom of the walls for capturing at least part of the fluid which exits from the bottom of the walls, means **3** and **5** associated with the top of the walls for adjusting fluid flow adjacent the top of the walls, spinneret **7** from which filaments **9** are extruded, and a convergence guide **8**.

Walls **1** through which filaments **9** and a quenching medium pass downwardly converge from top to bottom and conform to the cross-sectional and flow pattern of the filaments. In other words, the walls conform to the flow of filaments through the walls which are closely adjacent the paths of travel of the outermost filaments.

For most applications, the walls can be in the shape of a hollow truncated cone. This can be so even if a rectangular spinneret is used since the cross-section of the filaments becomes more circular as the filaments approach convergence guide **8**. But this is not to rule out the fact that there may in actuality be a plurality of walls forming square, rectangular, etc. cross-sectional shapes, or even a plurality of walls which are planar near the spinneret and become arcuate near the convergence guide, thus conforming exactly to the flow of filaments from a spinneret being other than circular.

Exterior of walls **1** is a wall engulfing shroud **2** which extends beyond the tops and bottoms of the walls and which is positioned to capture at least part of the fluid which travels with the filaments and exits through the bottom of the walls and redirect same back between the walls and shroud for flow adjacent the top of the walls onto the filaments.

It should be noted that both the walls and shroud will have to be spaced from the spinneret. This is so because the primary source of air used for quenching is obtained from the room occupied by the chimney and it must enter from the top. This air will flow downwardly through the walls along with the filaments; exiting through the bottom where at least part of same is captured and redirected, thus forming a secondary source of air which travels between the walls and shroud upwardly to be intermingled with the air obtained from the primary source.

Means **3** and **5** associated with the top of the walls for adjusting fluid flow can be projections which extend from the walls and shroud, for a distance at an angle within the range of from 0° to about ±180° from the plane of the walls and a plane parallel to the plane of the walls, respectively.

The plane parallel to the plane of the walls is herein defined to mean a plane passing through the uppermost portion of the shroud which will be the plane of the shroud should the walls and shroud be parallel.

Means **4** and **6**, which are associated with the bottom of the walls for capturing at least part of the air which exits from the bottom of the walls and shroud, can be defined in the same manner as means **3** and **5** with respect to angle, projection, and planes. Also, means **3**, **4**, **5**, and **6** can be made to be projectable, being hinged flaps, adjustable diaphrams, etc.

When operation is considered, this invention takes advantage of the fact that the moving filament threadline energizes the column of air within the walls to produce

a co-current axial flow of air as a result of the threadline frictional drag on the adjacent air. By referring to the drawing, it may be seen that primary air supply to the spinning chimney will therefore use the entire building as the air flow duct rather than elaborate special duct work associated with the spinning chimney itself. At the bottom of the walls, there is an adjustable aperture **6**, or damper as it is commonly called. By opening and shutting this device, the quantity of primary air entering at the top of the walls will be controlled. In this manner, the heat load of the threadline and air entering the walls may be brought into suitable balance. Stated more specifically, air enters the top of the walls via the opening at the top thereof and flows co-axially with the threadline discharging at the bottom as a result of the drag action of the moving filaments.

Insufficient air flow would be generated through the use of the walls alone since most of the directed energy associated with the moving threadline is lost from the system. By installing a shroud around the aforementioned walls, as shown in the drawings, it may be seen that a secondary air flow will be generated by the pumping action of the yarn. This combination more nearly utilizes all of the directed energy imparted to the moving air column and filaments and increases the total air flow associated with the moving filaments thereby imparting a greater velocity of air transverse to the threadline near the face of the spinnerette.

Considering the use of walls alone within the shroud just described, secondary air currents would be induced externally to the spinning console in the main operating area, and these secondary air currents would be extraneous and would be affected by the presence of machinery, operating personnel, and other factors that would give rise to subtle effects on the air currents adjacent the walls. By the presence of the external shroud, this effect would be eliminated. Also, the aperture at the bottom of the chimney wherein air is finally exhausted could be located physically below the floor grade which would allow venting of the spent hot air into a distinctly separate operating area.

At the start of operation, the filaments are passed down through the chimney by conventional techniques and strung up in the wind-up area below. Nothing further need be done as long as satisfactory operation is maintained. Should access to the filaments within the walls be necessary or desired, suitable doors and/or windows may be provided therefor.

The foregoing illustrates the essential features of the invention as well as some of the manners in which it may be practiced. Various changes and modifications may be made in practicing the invention without departing from the spirit and scope thereof, and therefore, the invention should not be limited except as defined in the appended claims.

We claim:

1. A spinning chimney for quenching filaments comprising walls which converge from top to bottom and through which the filaments and a quenching fluid pass downwardly, and a wall engulfing shroud extending beyond the tops and bottoms of the walls and positioned to capture at least part of the fluid which exists from the bottom of the walls and redirect same between the walls and shroud for flow adjacent the top of the walls

onto the filaments, the top of said wall being flared so as to provide, in conjunction with said shroud, controlled fluid flow from between said walls and said shroud onto said filaments.

2. A spinning chimney according to claim **1** wherein means for capturing at least part of the fluid which exits from the bottom of the walls comprise a flared bottom end of said walls.

3. A spinning chimney according to claim **1** wherein the shroud and walls are spaced from a spinneret through which the filaments are extruded.

4. A spinning chimney for quenching filaments comprising walls which converge from top to bottom and through which the filaments and a quenching fluid pass downwardly, and a wall engulfing shroud extending beyond the tops and bottoms of the walls, said walls and shroud being spaced from a spinneret through which the filaments are extruded, means associated with the bottom of the walls for capture at least part of the fluid which exits from the bottom of the walls and redirecting same back between the walls and shroud, and means associated with the top of the walls for adjusting fluid flow from between the walls and shroud adjacent to the top of the walls onto the filaments.

5. A spinning chimney according to claim **4** wherein the means associated with the tops and bottoms of the walls are adjustably projectable.

6. A spinning chimney according to claim **5** wherein the walls substantially conform to the cross-sectional pattern of the filaments.

7. A spinning chimney according to claim **5** wherein the walls form a hollow truncated cone.

8. A spinning chimney according to claim **5** wherein the walls and shroud are concentric truncated cones.

9. A spinning chimney according to claim **4** wherein the means associated with the top and bottom of the walls are projections which extend from the walls for a distance at an angle within the range of from 0° to about ±180° from the plane of the walls and a plane parallel to the plane of the walls, respectively.

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