

1

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APPARATUS FOR SPINNING FILAMENTS

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This invention relates to apparatus for spinning filaments and more particularly to apparatus for spinning a bundle of filaments some of which are conjugate.

It is known that conjugate filaments spun from spinning solutions having different shrinkage characteristics will curl or kink when annealed. Thus, the conventional step of crimping may be eliminated by the use of conjugate filaments. One of the major disadvantages of conventional conjugate spinnerettes is that they are limited to a very small number of spinning orifices. This naturally limits production. With this in mind, one of the objects of this invention is to provide new and improved apparatus for spinning filaments.

Another object of this invention is to provide apparatus for spinning a bundle of filaments having conjugate filaments therein.

A further object of this invention is to provide apparatus for spinning through a standard spinnerette a bundle of filaments having therein both composite filaments and filaments of a single spinning solution.

Still another object of this invention is to provide a spinnerette which is capable of spinning a large number of filaments, some of which are composite.

One embodiment of the present invention contemplates an apparatus for spinning filaments wherein one spinning solution is passed into a chamber through a spinnerette and another spinning solution is passed into the chamber through inlets on opposite sides of the chamber. The combined solutions pass through a restriction in the chamber and then exit from the chamber through a second spinnerette. Because of laminary flow, the solutions will not mix. Filaments formed at the central portion of the second spinnerette will be of the one composition while filaments formed at the annular other portion of the second spinnerette will be of the other composition. The filaments formed at an annular intermediate portion of the second spinnerette will be composite or conjugate. Annealing of the bundle of filaments, or tow, will curl or crimp the composite or conjugate filaments. These curled or crimped filaments deflect the other filaments from their linear configurations and hold the tow together.

Other objects and advantages of the present invention will become apparent when the following detailed description is read in conjunction with the appended drawing, in which,

FIGURE 1 is a cross sectional view of one embodiment of the invention showing the structural relationship of the various elements of the device, and

FIGURE 2 is a view taken on line 2—2 of FIGURE 1 illustrating the areas in which the different filaments are formed.

Referring now in detail to the drawing, a conventional first spinnerette plate 11 is shown clamped in a chamber 12 in a housing 13 by an insert 14 which is threaded into the housing 13. Gaskets 17 and 18 seal the junction between the insert 14 and the housing 13.

Spinning solution from a source 21 is forced into the chamber 12 through inlets 20 and 22 in the housing 13, this solution entering the chamber 12 on the downstream side of the first spinnerette 11. Another spinning solution, of a different color or chemical composition is forced from a source 25 through an aperture 26 in the insert 14 into the chamber 12 on the upstream side of the first spinnerette. This spinning solution then passes

2

through the first spinnerette 11 to join the spinning solution from the source 21. Because of the high viscosities and slow rates of flow of the two spinning solutions, the small streams leaving the first spinnerette 11 do not mix to any great extent. In other words, the flow of the combined solutions is laminar.

The small discrete streams of spinning solution from the first spinnerette 11 are moved inwardly or converged in the chamber 12 by the radially inward flow of the spinning solution from the source 21.

The chamber 12 is provided with a restriction through which the combined spinning solution flow to a second spinnerette 29 secured by a cap 30 to the housing 13, the spinnerette being positioned to close the chamber 12. Stated another way, the housing 13 is provided with chambers 12 and 32 which are interconnected by a restricted opening 36, the chamber 32 being a recess which is closed by the spinnerette 29 to form a chamber.

It can readily be seen that, as the combined solutions flow through the opening 36, the streams of solution from the first spinnerette 11 will occupy the central portion of the opening 36 while the spinning solution from the source 21 will occupy the outer portion of the opening 36. Along the line of junction of the two spinning solutions there will be discrete streams of solution from the source 25. These discrete streams, formed by the outermost orifices in the first spinnerette 11, which intersect the orifices in the second spinnerette 29 form composite or conjugate filaments. Inasmuch as there is a large number of these discrete streams and a large number of orifices in the second spinnerette 29, a large number of composite filaments will be formed.

The composite filaments will thus be positioned in the bundle of filaments in an annular band 40 (FIGURE 2) having a central radius equal to about one half of the radius of the circle defined by the intersection of the bundle of filaments with a plane parallel to the face of the second spinnerette.

Inside the annular band 40, the filaments will be formed by spinning solution from the source 25. This area is indicated by the reference numeral 41. In an annular band 42 surrounding the band 40 the filaments will be formed from the spinning solution from the source 21. In actual practice, different spinning solutions could be fed in through the inlets 20 and 22, so that different filaments in the band 40 would be made up of different combinations of spinning solutions.

When the bundle of filaments or tow, is subsequently annealed the composite filaments curl and twist in a well known manner. This self crimping of the composite filaments tends to deflect the other filaments from their normal linear configurations and also tends to hold the tow together, thereby giving the tow a better appearance and materially improving the ease of subsequent processing.

It is to be understood that the embodiment disclosed herein is merely illustrative and that numerous other embodiments can be contemplated which will fall within the spirit and scope of the invention.

What is claimed is:

1. A device for spinning filaments, comprising a housing having a passageway therethrough, and a pair of spinnerette plates mounted in said passageway, each of said spinnerettes having therein an array of spinning orifices substantially covering the face of said spinnerette so that substantially all portions of the face of each spinnerette are provided with spinning orifices, one of said spinnerette plates being positioned downstream from the other, said housing having a first inlet leading to the passageway at a point upstream of both of said spinnerette plates, said housing having a second inlet leading to the passageway at a point between said spinnerette plates, said pas-

3

sageway having a restriction downstream of said second inlet.

2. A device for spinning filaments, comprising a housing having therein a pair of chambers interconnected by a restricted passageway, a first spinnerette plate mounted in one of the chambers, and a second spinnerette plate secured to the housing in a position closing the other chamber, said housing having a first inlet on one side of the first spinnerette plate and a second inlet on the other side of said first spinnerette plate.

3. A device for spinning filaments, comprising a housing having a restricted passageway extending therethrough for the passage of a first spinning solution and also having an enlarged chamber at an intermediate point in said passageway, a first spinnerette plate mounted in the chamber, and a second spinnerette plate mounted across the passageway at one end of the housing, said housing having an inlet for the admission of a second spinning solution into the chamber at a point downstream of said first spinnerette plate,

4. A device for spinning filaments, comprising a housing having therein a chamber and a recess, said housing having extending therethrough a restricted passageway intersecting the chamber and the recess, a first spinnerette mounted in the chamber in such a position that a spinning solution flowing into said passageway passes through said first spinnerette into the chamber, and a second spinnerette mounted on the housing over the recess therein, said

4

housing also having therein a plurality of inlets leading to the chamber downstream of said first spinnerette.

5. A device for spinning filaments, comprising a housing having therein a chamber and a recess interconnected by a restricted passageway, a first spinnerette positioned in one said chamber, an insert secured in the chamber for holding said spinnerette, said insert having therein an opening for the passage of a spinning solution to said spinnerette, a second spinnerette positioned on the housing to cover the recess therein, and a cap secured to the housing for holding the second spinnerette, said housing having therein a plurality of inlets leading to the chamber at points between said spinnerettes.

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