

March 30, 1954

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2,673,368

SPINNERETTE

Filed May 3, 1951

FIG. 1.

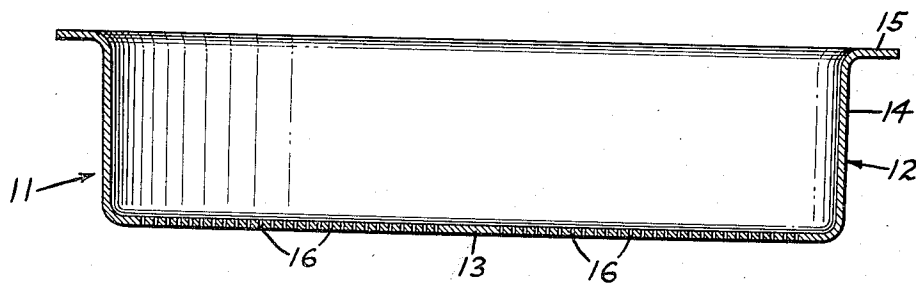
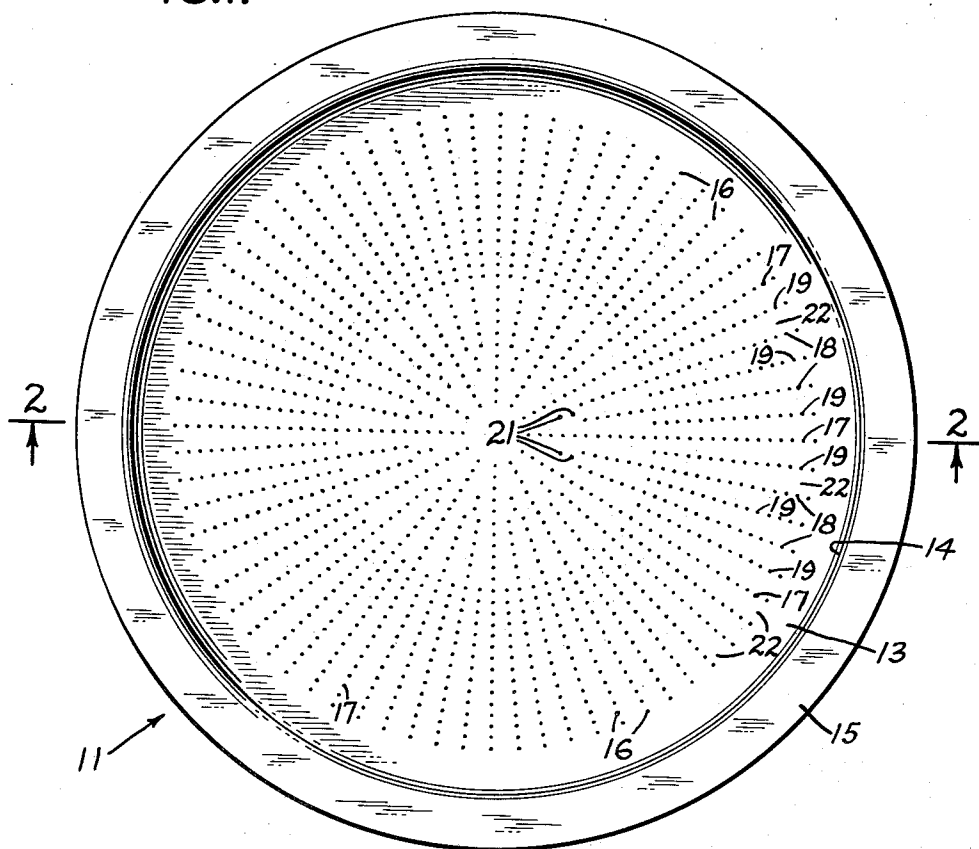


FIG. 2.

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2,673,368

SPINNERETTE

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Application May 3, 1951, Serial No. 224,353

7 Claims. (Cl. 18—8)

1

This invention relates to artificial filamentary materials and relates more particularly to apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments.

In the production of multi-filament artificial filamentary materials, it is the general practice to force a filament-forming material through a spinnerette, having a plurality of apertures in the face thereof, into a coagulating medium which converts the material passing through each aperture into a filament. As the filament-forming material emerges from the apertures, the coagulating medium will cause said filament-forming material to set, for example, by cooling the same, by removing a solvent therefrom, by entering into a chemical reaction therewith, or by a combination of these effects. For example, in the production of artificial filamentary materials from cellulose acetate or other lower aliphatic acid esters of cellulose, a solution of the cellulose acetate in acetone or other suitable solvent is forced through the apertures in a spinnerette into a coagulating medium which removes the acetone therefrom by evaporation or extraction. On the other hand, in the production of regenerated cellulose artificial filamentary materials by the viscose process, a solution of viscose in aqueous caustic soda is forced through the apertures in a spinnerette into a liquid coagulating medium which reacts with and initiates the regeneration of the cellulose from the viscose.

To obtain artificial filamentary materials having uniform properties the spinnerette must be designed to permit access of adequate quantities of the coagulating medium to the filament-forming material as it emerges from each of the apertures in the spinnerette. When artificial filamentary materials, such as yarns, containing less than a hundred filaments are being produced, no special difficulties are encountered in providing for a free access of fluid to each of the filaments. When, however, artificial filamentary materials, such as heavy filaments or tow, containing from about 150 or 300 up to about 5000 or more filaments are being produced from a single spinnerette, difficulties are often experienced in obtaining a free access of fluid to each of the filaments since the spinnerette and the bundle of filaments emerging therefrom is only a few inches in diameter. These difficulties are especially pronounced in the production of regenerated cellulose artificial filamentary materials by the viscose process, particularly when the spinnerette is immersed in the coagu-

2

lating medium so that the filaments are spun downwardly from the lower face thereof. This is due to the fact that gaseous products are formed during the regeneration of the cellulose and these gaseous products tend, if not removed from the vicinity of the spinnerette by an adequate flow of the coagulating medium, to collect on the lower face of the spinnerette and may grow into bubbles of sufficient size to interrupt the continuity of spinning of one or more filaments.

It is an important object of this invention to provide apparatus for the production of multi-filament artificial filamentary materials which will be free from the foregoing and other disadvantages.

A further object of this invention is to provide apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments which will provide for a relatively free access of fluid to each of the filaments as it is formed.

Another object of this invention is to provide a spinnerette of improved construction for the production of multi-filament artificial filamentary materials.

Other objects of this invention will be apparent from the following detailed description and claims.

According to the present invention, there is provided a spinnerette whose face has a diameter of between about 1 and 3 inches and contains from about 150 or 300 up to about 5000 or more apertures extending therethrough, the apertures being arranged in groups of rows, one group of rows extending radially outwardly from points relatively close to the center of said face almost to the outer edge thereof, another group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the first group of rows extend and almost to the outer edge of said face, and a third group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the second group of rows extends and almost to the outer edge of said face. The rows of apertures are so arranged that between each pair of rows, the face of the spinnerette is provided with straight unperforated portions extending radially inwardly from the edge of the center of said face and having a width at least equal to the spacing between adjoining apertures in a row. For dry-spinning processes, i. e. processes in which a gaseous agent is employed as

3

the coagulating medium, this width should be at least about 0.40 mm. For wet-spinning processes, i. e. processes in which a liquid agent is employed as the coagulating medium, this width should be at least about 1.2 mm. The unperforated portions on the face of the spinnerette provide a path along which the coagulating medium can flow freely to each of the filaments emerging from the spinnerette.

A preferred embodiment of this invention is shown in the accompanying drawing wherein

Fig. 1 is a plan view, on an enlarged scale, of the spinnerette, and

Fig. 2 is a cross-sectional view taken along the line 2—2 in Fig. 1 in the direction of the arrows.

Referring now to the drawing, the reference numeral 11 indicates generally a spinnerette which has a cup-shaped body portion 12 including a flat face 13 and a rim 14. Projecting outwardly from the rim 14 is a flange 15 which provides means for mounting the spinnerette during use. The spinnerette 11 may be formed of any suitable material which will resist the corrosive effects of the composition containing the filament-forming material and of the coagulating medium. The face 13 of the spinnerette 11 is provided with a plurality of apertures 16 extending therethrough, which apertures 16 have a diameter ranging from about 0.045 to 0.30 mm. The apertures 16, of which there may be a total of from about 150 or 300 up to about 5000 or more in the face of the spinnerette 11, are arranged in rows 17 extending radially outwardly from points relatively close to the center of the face 13 almost to the outer edge thereof, rows 18 extending radially outwardly from points spaced further away from the center of the face 13 than the points from which the rows 17 extend and almost to the outer edge of said face, and rows 19 extending radially outwardly from points spaced further away from the center of the face 13 than the points from which the rows 18 extend and almost to the outer edge of said face. As shown in the drawing, there are a pair of rows 18 between each pair of rows 17 and the rows 19 alternate with the rows 17 and 18. If desired, there may also be provided pairs 21 of apertures 16 positioned between the rows 17 and radially inwardly of the ends of the rows 18. Positioned between each pair of rows on the face 13 of the spinnerette 11 are a plurality of straight unperforated portions 22 extending radially outwardly from the center of said face to the edge thereof and having a width as specified above. The rows of apertures 16 may also be arranged so that there is a single row 18 between each pair of rows 17 and the rows 19 alternate with the rows 17 and 18.

During the spinning of artificial filamentary materials through the spinnerette 11, the coagulating medium will flow freely along the unperforated portions 22 of the face 13 of the spinnerette to the filaments emerging from each of the apertures 16 so that each of said filaments will be set under substantially the same conditions.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. In an apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments, a spinnerette including a face having at least about 150 apertures

4

extending therethrough, said apertures being arranged in groups of rows of equally spaced apertures, one group of rows extending radially outwardly from points relatively close to the center of said face almost to the outer edge thereof and another group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the first group of rows extend and almost to the outer edge of said face, a plurality of rows of the latter group of rows being positioned between each pair of rows of the first-mentioned group of rows, and said groups of rows being so arranged that the face of the spinnerette has unperforated portions between each pair of rows extending radially inwardly from the outer edge to the center of said face whereby there will be a free flow of fluid to the filaments emerging from each of the apertures in said spinnerette.

2. In an apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments, a spinnerette including a face having at least about 150 apertures extending therethrough, said apertures being arranged in groups of rows of equally spaced apertures, one group of rows extending radially outwardly from points relatively close to the center of said face almost to the outer edge thereof and another group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the first group of rows extend and almost to the outer edge of said face, a plurality of rows of the latter group of rows being positioned between each pair of rows of the first-mentioned group of rows, and said groups of rows being so arranged that the face of the spinnerette has unperforated portions having a width of at least about 0.40 mm. between each pair of rows extending radially inwardly from the outer edge to the center of said face whereby there will be a free flow of fluid to the filaments emerging from each of the apertures in said spinnerette.

3. In an apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments, a spinnerette including a face having at least about 150 apertures extending therethrough, said apertures having a diameter of between about 0.045 and 0.30 mm., and said apertures being arranged in groups of rows of equally spaced apertures, one group of rows extending radially outwardly from points relatively close to the center of said face almost to the outer edge thereof and another group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the first group of rows extend and almost to the outer edge of said face, a plurality of rows of the latter group of rows being positioned between each pair of rows of the first-mentioned group of rows, and said groups of rows being so arranged that the face of the spinnerette has unperforated portions between each pair of rows extending radially inwardly from the outer edge to the center of said face whereby there will be a free flow of fluid to the filaments emerging from each of the apertures in said spinnerette.

4. In an apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments, a spinnerette including a face having at least about 300 apertures extending therethrough, said apertures being arranged in groups of rows of equally spaced apertures, one group of rows extending radially outwardly from

5

points relatively close to the center of said face almost to the outer edge thereof, another group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the first group of rows extend and almost to the outer edge of said face and a third group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the second group of rows extend and almost to the outer edge of said face, pairs of said second group of rows being positioned between each pair of said first group of rows and the rows of said third group of rows alternating with the rows of the first and second groups of rows whereby the face of the spinnerette has unperforated portions between each pair of rows extending radially inwardly from the outer edge to the center of said face and there will be a free flow of fluid to the filaments emerging from each of the apertures in said spinnerette.

5. In an apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments, a spinnerette including a face having at least about 150 apertures extending therethrough, said apertures being arranged in groups of rows of equally spaced apertures, one group of rows extending radially outwardly from points relatively close to the center of said face almost to the outer edge thereof, another group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the first group of rows extend and almost to the outer edge of said face and a third group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the second group of rows extend and almost to the outer edge of said face, the rows of said second group of rows alternating with the rows of said first group of rows and the rows of said third group of rows alternating with the rows of the first and second groups of rows whereby the face of the spinnerette has unperforated portions between each pair of rows extending radially inwardly from the outer edge to the center of said face and there will be a free flow of fluid to the filaments emerging from each of the apertures in said spinnerette.

6. In an apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments, a spinnerette including a face having at least about 300 apertures extending therethrough, said apertures having a diameter of between about 0.045 and 0.30 mm., and said apertures being arranged in groups of rows of equally spaced apertures, one group of rows extending radially outwardly from points relatively close to the center of said face almost to the outer edge thereof, another group of rows extending radially outwardly from points spaced further away

6

from the center of said face than the points from which the first group of rows extend and almost to the outer edge of said face and a third group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the second group of rows extend and almost to the outer edge of said face, the rows of said second group of rows alternating with the rows of said first group of rows and the rows of said third group of rows alternating with the rows of the first and second groups of rows whereby the face of the spinnerette has unperforated portions between each pair of rows extending radially inwardly from the outer edge to the center of said face and there will be a free flow of fluid to the filaments emerging from each of the apertures in said spinnerette.

7. In an apparatus for the production of multi-filament artificial filamentary materials having a large number of filaments, a spinnerette including a face having at least about 300 apertures extending therethrough, said apertures having a diameter of between about 0.045 and 0.30 mm., and said apertures being arranged in groups of rows of equally spaced apertures, one group of rows extending radially outwardly from points relatively close to the center of said face almost to the outer edge thereof, another group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the first group of rows extend and almost to the outer edge of said face and a third group of rows extending radially outwardly from points spaced further away from the center of said face than the points from which the second group of rows extend and almost to the outer edge of said face, pairs of said second group of rows being positioned between each pair of said first group of rows and the rows of said third groups of rows alternating with the rows of the first and second groups of rows whereby the face of the spinnerette has unperforated portions having a width of at least about 1.20 mm. between each pair of rows extending radially inwardly from the outer edge to the center of said face and there will be a free flow of fluid to the filaments emerging from each of the apertures in said spinnerette.

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