June 26, 1934. E. S. BRUMBERGER 1,964,659

SPINNERETTE

Filed Feb. 9, 1933

Fig. 1.

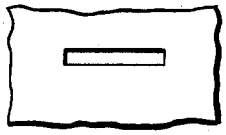

Fig. 2.

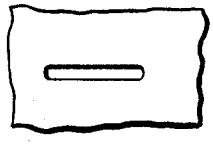

Fig. 3.

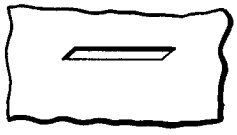

Fig. 4.

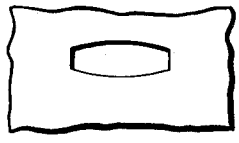

Fig. 5.

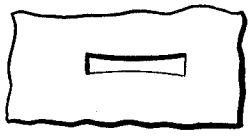

Fig. 6.

Fig. 10.

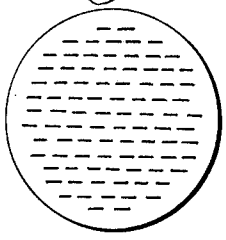

Fig. 7.

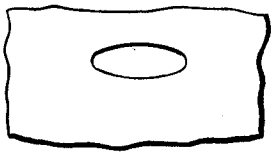

Fig. 8.

Fig. 9.

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UNITED STATES PATENT OFFICE

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SPINNERETTE

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3 Claims. (Cl. 18—8)

This invention relates to a process of and means for the production of a new multi-filament artificial yarn made from solutions containing cellulosic materials.

In the spinning of artificial multi-filament yarns from cellulosic materials, the practice has been to extrude these materials or solutions thereof through circular orifices which forms filaments having a cross section usually round, but sometimes a cross section may have been of horse-shoe shape or kidney shape, or the like.

I have found that if, instead of extruding the cellulosic materials through circular orifices as heretofore in the spinning of multi-filament yarns, I used orifices that are rectangular or squatty elliptical in shape, or parallelogramic or similar shapes with straight or curved sides, I produced a multi-filament yarn, the filaments of which have a cross-section of very long and thin shape. The ratio of the length to the width of this cross section is far greater than any heretofore produced in multi-filament yarn by the use of round orifices. The cross-section of a filament may be generally a rectangle bent somewhat or folded over on itself.

By my invention, the yarn produced can be made for a given denier, much softer than ordinary yarn, or for a given denier I can make a yarn much stiffer and harsher than ordinary yarn. In other words, I can take any particular denier and make a yarn softer than ordinary yarns, or I can take the same denier and make it stiffer and harsher than ordinary yarn. This is done by regulating the relative size of the orifices and the number of such orifices used. By the same method, this invention controls the degree of covering power of the yarn produced. In other words, I can control the softness, harshness and covering power of the yarns by the use of my invention, by variations in the size or shape or both of the orifices in the spinnerette.

The type of yarn made by my process and spinnerette is superior in softness and covering power to ordinary yarns of the same size. My process can produce types of yarn of a given denier which is either harsher or softer than ordinary yarns, and at the same time having a greater covering power than ordinary yarns. Softness is not sacrificed in increasing the covering power. This invention gives more softness per denier per filament than with the ordinary method, while at the same time giving greater strength per filament, making stronger fabrics, and making it easier for the rayon yarn manufacturer and textile plant.

My process is applicable to all deniers. It has special advantage in the class of higher deniers, such as 400, 600, 1200 and higher, where softness and high covering power is difficult to obtain by the ordinary methods. Another application it has is in the manufacture of low deniers, such as 100 and lower, 125, 150, 200 and 300 denier where harshness and high covering power is difficult to obtain by ordinary methods of spinning multi-filament yarn.

My process is applicable to all processes for the manufacture of artificial multi-filament yarns, such as the cupra-ammonium, viscose, cellulose-acetate, cellulose-nitrate, and any other processes where cellulose and its derivatives are used to produce multi-filament yarns.

My process is also applicable to processes producing bright yarn, delustered yarn, or semi-delustered yarn. The multi-filament yarn made according to my invention can be given any degree of twist desired, depending upon the use to which it is to be put. Thus, some yarns will require twist, others will require one turn per inch, two turns per inch or higher.

The coagulating mediums in which the filaments are precipitated are those ordinarily used in the respective processes. Thus, in the viscose-process, the coagulating bath is sulphuric acid, sodium sulphate, together with zinc and glucose, in the proportions ordinarily used. In the cupra-ammonium process, the coagulating bath may be either acid or alkali. In the processes where the cellulosic material is dissolved in volatile solvents, such as in the cellulose-acetate and cellulose-nitrate processes, the coagulating medium is an evaporative atmosphere.

The multi-filament yarns made according to this invention may be used by themselves or associated or twisted together with other artificial or natural fibers. The multi-filament yarns made according to this invention have a special application in the manufacture of staple fiber. Yarn made by this invention may be used for knitting, weaving, or crocheting, or for the manufacture of braids, bristles, general novelties.

In the accompanying drawing,

Fig. 1 is a view of a rectangular orifice in a spinnerette made in accordance with this invention;

Figs. 2, 3, 4, 5, 6 and 7 are similar views showing orifices of different shapes which may be used;

Figs. 8 and 9 are sectional views through countersunk orifices; and

Fig. 10 is a bottom plan view of a spinnerette

showing a substantial number of orifices, which may be of any of the above types.

The figures in the drawing are exaggerated for the sake of clearness and each of Figs. 1 to 9 shows only one orifice, although it will be understood that the spinnerette will have any size and number of orifices as found desirable, one arrangement being shown in Fig. 10, the size and number depending on the type of multi-filament yarn desired, all of which orifices may be of the same or of different shapes, as for instance, the rectangular orifices as shown in Figs. 1 and 2, the parallelogram as shown in Fig. 3, or other straight sided figure, or of a curved sided figure as shown in Figs. 4, 5 and 6, or elliptical orifices shown in Fig. 7, which orifices may be used by themselves, or with each other or with the ordinary type of circular orifice. The orifices may be counter-sunk as shown in Figs. 8 and 9, and any of these may be of different widths or lengths, as found desirable. The filaments produced by forcing the cellulosic solution through any of such orifices will have a cross-section of the same general shape and relative proportions as the orifices producing the filaments. This will be affected to some extent on the treatment of the yarn after it leaves the spinnerette. For example, the cross-section will depend to some extent on the degree of shrinking which in turn will depend in the degree of setting in the coagulating bath and whether the yarn is stretched in any of the subsequent treatment or whether the yarn is given any chemical treatment such as caustic soda with or without stretching during the application of those treatments.

While I have illustrated and described various forms of orifices, it will be understood that the orifices may be of any desired shape so long as they are long and narrow with continuous side edges and which will still produce the desired results of multi-filament yarn. For instance, in addition to the figures mentioned above, the orifices may be of the shape of a trapezoid or trapezium or have curved sides or some of the sides at right angles to each other and other sides at acute angles.

As an example of the use of this invention, a spinnerette containing 120 rectangular orifices, each .015'' x .0025'' is used on a spinning machine operating at a usual rate in connection with a usual coagulating bath of the usual composition. The rate of spinning and extent of immersion in the bath is such as will give the desired coagulated thread on leaving the spinning machine. After spinning the yarn is given the usual wash and bleach purification. This makes a 1200 denier yarn which is superior in softness and covering power to ordinary yarns of the same denier and has a characteristic feel different from ordinary yarn. Each filament of such yarn as thus produced is of a long narrow shape of .0678'' x .00267''.

If the spinnerette is changed, all other conditions being the same, and one used containing 33 rectangular orifices, each .040'' x .0025'', I can make the same 1200 denier yarn, the filaments of long narrow shape .2713'' x .0106'' which will be very much stiffer and harsher than ordinary yarns but it will still retain its high covering power.

For spinning 150 denier yarn, the number of filaments ordinarily used heretofore has been 24, 44, or 60, the orifices being circular and of respective diameters of .0045'', .0040'', or .0035''. A yarn as thus produced has been generally accepted as the softest for that particular size, 150 denier.

In my invention, to produce 150 denier yarn, I may use 15 rectangular slots in the spinnerette, each of which is .015'' x .0025'', and get a yarn much softer and with more covering power than any of the above mentioned ordinary yarns. It also yields a yarn which has a greater breaking strength per filament.

While I have referred to only 1200 and 150 denier in the examples given, this invention can be applied to fine deniers down to less than 100 and up to any deniers above 1200.

Besides the harshness or softness of the yarns mentioned above in the examples given, different degrees of harshness or softness may be effected in the same deniers or in different deniers.

The expression "multi-filament yarn" in the claims is restricted to soft yarns and is used to distinguish from coarse straw or film, ordinarily made and used as a single strand and which is harsh and brittle.

However, multi-filament yarn made in accordance with this invention may be termed harsh yarn or the like as described above, but it is not similar to the single strand straw or the like produced heretofore.

I claim:

1. A spinnerette for forming multi-filament yarn having a plurality of orifices therein each of which is of long narrow shape of a length of approximately .015'' to .040'', and a width of approximately .0025''.

2. A spinnerette for forming multi-filament yarn having a non-reticulate end consisting of a single continuous body with a plurality of orifices therein, each of which is of long, narrow shape, of a length of approximately .015'' to .040'', and a width of approximately .0025'' and having the long side edges thereof continuous and unbroken from end to end.

3. A spinnerette for forming multi-filament yarn having a plurality of orifices therein, each of which is approximately rectangular in shape and of a length of approximately .015'' to .040'' and a width of approximately .0025'' and having the long side edges thereof continuous and unbroken from end to end.

EDWARD S. BRUMBERGER.