PRODUCTION OF YARNS FROM IRREGULAR DENIER


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This invention relates to the production of yarns of irregular denier known as slub yarns.

French patent specification Number 766,852 (January 11, 1934) (La Soie Artificielle de Calais) describes the production of regenerated cellulose yarns by supplying to a single spinning jet a bright and a dull viscose, or viscoses of different colours, which can be extruded either simultaneously or alternately.

French patent specification Number 803,144 (June 29, 1935) (Comptoir des Textils Artificiels) describes the production of single filaments of regenerated cellulose having swellings at intervals, by intermittently injecting a gas into the viscose supplied to the spinning jet. In place of the gas a different solution, such as a dyed viscose, may be injected, so that slubs of different colour may be formed in the monofilament.

German patent specification Number 741,359 (ausgegeben November 13, 1943) (E. G. Farbenindustrie A.G.) described the production of slub-like or linen-like artificial threads by supplying spinning solution to the spinning jet in two streams, one a uniform stream and the other in pulses at a higher pressure.

The present invention consists in producing a multifilament yarn of one colour having slubs of a different colour by extruding through a spinning jet a first fibre-forming liquid at uniform pressure having the colour of the yarn and intermittently interrupting the flow of the first liquid to spinning holes in the jet by injecting intermittently a second fibre-forming liquid having the colour of the second fibre-forming liquid is supplied to a nozzle immediately behind spinning holes in the jet, but spaced only sufficiently from spinning holes in the jet to allow the first fibre-forming liquid to regain access immediately to the whole of spinning holes in the jet at the end of the slab. To do this a first fibre-forming liquid is supplied to a multihole jet and a second fibre-forming liquid is supplied to a nozzle immediately behind spinning holes in the jet but spaced from the spinning holes in the jet face element as hereinbefore defined so that the second liquid delivered intermittently by the nozzle passes immediately through the jet to form a slab and interrupts the normal flow of the first liquid to the jet, but allows the normal flow to be resumed immediately at the end of a slab.

Were the second solution to be injected at any appreciable distance from spinning holes in the jet a slab would be produced but the change in colour would not correspond with the change in denier so that the position of the nozzle close to spinning holes in the jet is important.

Preferably the pump feeding the second fibre forming liquid sucks back a small quantity of the second liquid at the end of each slab to provide a sharp change of colour and denier at the tail end of the slab.

An example of apparatus for spinning viscose rayon yarn according to the invention is shown in the accompanying drawing, in which:

FIGURE 1 shows the apparatus diagrammatically.
FIGURE 2 is a longitudinal section of the jet, and FIGURE 3 shows an example of yarn according to the invention.

In FIGURE 2, a conical spinning jet 1 is secured to a rounder end 2 by a screwed coupling 3, a seal being formed by the rubber ring 4. A nozzle 5 is supported centrally behind the face element 6 of the jet 1 by radial centering members 7. The nozzle is connected by a pipe 8 in which is a strainer 24, to an injector type pump 9 (FIGURE 1) as described in our British patent application Number 19852,56, which delivers coloured viscose in sharply defined pulses at a pressure higher than the clear, uncoloured viscose supplied at a uniform rate through the rounder end 2. The lip of the nozzle 5 is not more than 75% of an inch behind the face element 6 of the jet containing the spinning holes.

In FIGURE 1, the rounder end 2 is supplied with viscose from a supply line 10 by a gear-type metering pump 11 through a candle filter 12 and final filter 23. The injector pump 9 draws coloured viscose from a supply line 13 and may be actuated by a cam, or, as shown, by a pneumatic piston in the cylinder 14, the supply of air being controlled by an electro-magnetically operated valve 15.

To obtain sharp changes in colour, elasticity in the pipe 8 must be reduced to a minimum, and for this reason the pipe 8 is made rigid and as short as possible, say ¾ inch bore and 20 inches long, and there is no filter but only the strainer 24 between the pump 9 and the nozzle 5. The viscose drawn from the line 13 should therefore be very clean. It is also important that no air should be allowed to enter the injector system and provide a cushioning effect.

In the injector pump 9, the spring-loaded delivery valve may itself be shaped as a plunger working in the delivery valve chamber, so that it sucks back slightly as the valve closes, thus absorbing any "tailing" effect due to the invariable small elasticity of the pipe 8.

In FIGURE 1 the jet 1 is immersed in a dilute acid bath and the threads are taken via guides 17, 18 to a godet or other take-up device 19. The guide 17 has the effect, particularly necessary at spinning speeds above 50 metres per minute, of preventing the slubs in the various individual filaments from moving longitudinally and thus becoming out of place. The guide 17 is about 10 inches from the jet and lifts the yarn about 1 inch above the surface of the bath.

FIGURE 3 shows an example of the yarn produced. It will be seen that the "base" denier of the yarn 20 is very uniform and that, in the example, the colour change is substantially confined to a range of 5.5 to 6.0. Figure 21 formed at each end of the slubs 22, the bulk of the slubs are uniformly coloured. Such samples are obtained on a 150 base denier 72 filament yarn by supplying pulses of coloured viscose weighing between 0.02 and 0.05 grain, the best results being obtained with pulses of 0.030 to 0.040 gram.

For a jet of 72 holes each 0.03 inch diameter, in which all the holes are in a circle of ¾ inch diameter, when the gap from the nozzle 5 to the jet face element 6 is 0.76 inch, the diameter of the nozzle orifice be at least 0.045 inch, preferably 0.060 inch. For a gap of 0.76 inch, the orifice in the nozzle 5 may be smaller, from 0.028 to 0.045 inch. If the orifice is smaller than the ranges specified, the slubs will consist of a mixture of two colour filaments. If the holes are larger the colours tend to mix. The smaller the gap, the better the colour definition, but the greater the difficulties of spinning.

The following are two examples of spinning viscose containing 7.6 percent cellulose, 6.2 percent caustic soda and 33 percent carbon disulphide based on the weight of alphacellulose, and at Ball Fall viscosity of 43 at 15° C. and a salt figure of 5 into a coagulating and regenerating bath containing 11 percent sulphuric acid, 1.5 percent zinc sulphate and 18 percent sodium sulphate at a temperature of 60° C., all percentages being by
weight. The jet had 72 holes each of 0.003 inch diameter, in an 1/4 inch diameter circle. The total immersion of the thread in the bath was 27 inches. The coloured viscose was identical with the clear viscose forming the base thread except that it contained 5 cc. per kg. of viscose of Monastral Blue paste. The pulses of coloured viscose were injected at regular intervals by an injector pump as shown in FIGURE 1. The pipe 8 was of stout lead 20 inches long, and in Example 1, the suck-back of the pump 9 was 0.039 cc. per pulse.

Example 1

Spinning speed..............m./minute... 46
Delivery of pump 11..............g./minute... 10.2
Diameter of orifice in nozzle 5..............Inches... 0.045
Gap ............................................ do... 0.02
Size of pulse of coloured viscose..............g./pulse... 0.035
Pulse rate..............................per minute... 200

This gave a yarn 20 of base denier 135 with slubs 22 of denier 1270. Colour definition was very good with equal white shoulders 21 at each end. The length of each slab was 4 cm.; the length of the coloured part was 3 cm.

Example 2

The pump 9 had no suck-back.

Spinning speed..............m./minute... 70
Delivery of pump 11..............g./minute... 15.5
Diameter of hole in nozzle 5..............Inches... 0.045
Gap ............................................ do... 0.02
Size of pulse of coloured viscose..............g./pulse... 0.035
Pulse rate..............................per minute... 100
Base denier of yarn 20.............. 150
Slub denier...................................... 730
Slub length................................. cm... 6

Both ends of the slubs were identical and coloured, showing slight mixing of the two viscoses over the first and sixth centimetres.

What we claim is:
1. Apparatus for producing artificial multi-filament yarns of one colour having slubs of a different colour, comprising a multi-hole jet element, means to supply a first fibre-forming liquid to said jet element, said element having a hollow chamber with a smooth wall immediately behind the spinning holes in the jet, a nozzle coaxial with said jet element and immediately behind the spinning holes in the jet element, and means to supply intermittently a second fibre-forming liquid to said nozzle at a higher pressure than the pressure of said first fibre-forming liquid, the nozzle projecting into the chamber to a position close to the spinning holes; whereby the color changes back to the first fibre-forming liquid are coterminal with the ends of the slubs.
2. A method of producing artificial filament yarns of one color having slubs of a different color, comprising the steps of extruding through a multi-hole spinning jet under a first pressure, a first fibre-forming liquid having the color of the yarn and intermittently injecting at a higher pressure immediately behind the jet face, a second fibre-forming liquid having the colour of the slubs, the second liquid passing through the jet holes under the influence of the higher pressure and the first fibre-forming liquid regaining access to the jet face as the higher pressure falls to about the first pressure.
3. A method as claimed in claim 2 wherein a small quantity of the second fibre-forming liquid is sucked back at the end of each delivery stroke.
4. Apparatus according to claim 1 in which said means to supply intermittent slubs comprises a pump adapted to withdraw a small quantity of the second fibre-forming liquid at the end of a slab.

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