June 2, 1936. W. I. TAYLOR 2,042,743

PRODUCTION OF ARTIFICIAL FILAMENTS

Filed Sept. 4, 1929

FIG. 1.

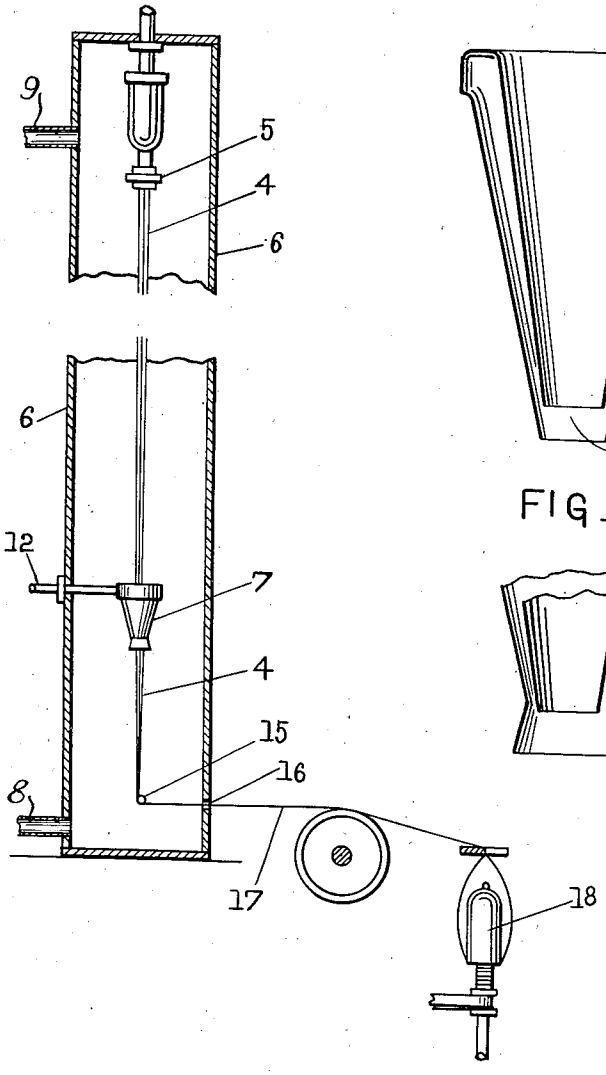


FIG. 2.

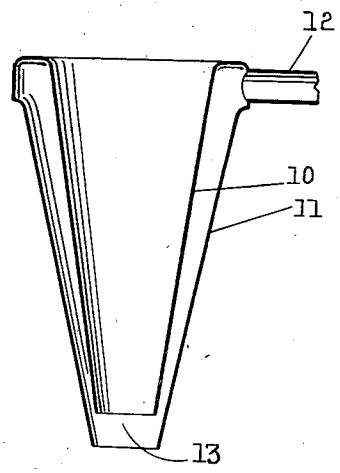


FIG. 3.

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PRODUCTION OF ARTIFICIAL FILAMENTS

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6 Claims. (Cl. 18—8)

This invention relates to the production of artificial silk filaments or other products obtainable by extrusion by the dry or evaporative method, i. e., by extruding a spinning solution through a jet or nozzle into an evaporative medium, and the object of the invention is to provide a new or improved process and new or improved apparatus for reducing the denier of the filaments or other products.

According to the invention, a gaseous or other fluid stream is applied to the filaments or other products in the course of their production by the dry or evaporative method in such a manner that they are propelled by the stream at a speed greater than that of their extrusion. The filaments or other products are thereby stretched and reduced in denier, the amount of stretch imparted by this means being a function of the tractive force applied by the stream and, therefore, capable of being varied by adjusting the velocity of the fluid flow.

The gaseous or other fluid stream may be caused in any suitable manner to act on the filaments or other products (hereafter referred to as "filaments"), a convenient way being to cause the stream to exert an ejector action on the filaments, as by the employment of a device comprising two tubes, preferably conical, forming an annular space into which the fluid, e. g. compressed air, is introduced. The outlet for the fluid is at the end of the device remote from that at which the filaments enter, and the fluid issuing from this end exerts an ejector action on the filaments to draw them through and propel them from the device.

The stretching or drawing may be effected inside or outside the spinning chamber or cell, the filaments being led from the chamber or cell in any convenient way when the operation is carried out outside the chamber or cell. In any case, however, when a plurality of filaments is to be stretched or drawn simultaneously the fluid action is preferably applied at some distance from the face of the jet or nozzle so that the filaments are in a dry or substantially dry state, and have ceased to be adhesive. Otherwise, if the filaments are sticky by reason of residual solvent contained therein, they tend to adhere together if they come into contact with each other.

When the stretching or drawing of the filaments has been completed, the filaments may if required be associated into a thread and be wound, or twisted and wound, in any suitable way, preferably outside the chamber or cell, continuously with their production or otherwise.

It is to be understood that the invention is applicable to the stretching or drawing either of a plurality of filaments simultaneously or of separate filaments.

The invention is particularly applicable to the production of artificial filaments from spinning solutions having a basis of cellulose acetate or other cellulose derivatives, such as cellulose formate, propionate, or butyrate, or thiocarbamic or alkoxy-alkacyl esters of cellulose, or methyl, ethyl, or benzyl cellulose, or the condensation products of cellulose and glycols or other polyhydric alcohols.

The accompanying drawing illustrates how the invention may be carried into effect with particular reference to the production of artificial filaments by extruding a spinning solution downwardly into an evaporative medium. It is to be understood, however, that the following description is given by way of example only and is in no way limitative.

Fig. 1 is a vertical section of the apparatus,

Fig. 2 is a diagrammatic section of the drawing-down device,

Fig. 3 is another form of the device shown in Fig. 2.

Filaments 4 which have been spun from the jet 5 pass as a bundle down the cell 6 which is provided with means 8 and 9 for the introduction and withdrawal of evaporative medium and enter the larger end of a drawing-down device 7 which as shown in Fig. 2 consists of inner and outer cones 10, 11 connected at their larger ends. The device is arranged at such a distance from the jet 5 that, because of the removal of a substantial part of the volatile solvent, the filaments have ceased to be adhesive and are in no danger of sticking together. Compressed air is introduced through the pipe 12 into the annular space between the cones. Air issues from the outlet 13 of the device 7 and exerts an ejector action on the filaments 4, which are drawn through the device, and ejected from it at such a speed greater than the speed of extrusion that they are reduced in denier to an extent depending on their issuing velocity. The outlet of the device 7 may be flared, as shown at 14, by extending one or both of the cones 10, 11.

The filaments pass round a guide 15 and are withdrawn from the cell 6 through any suitable opening 16 in the side or bottom of the cell, preferably being associated to form a thread 17. The filaments or thread may be collected by winding, or twisting and winding, for example, by means of a cap-spinning device 18.

Prior to winding, the filaments may be subjected to any suitable operation such as moistening, lubricating, or sizing.

The invention is, of course, not limited to processes involving downward spinning.

In the annexed claims, the expression "artificial silk filaments" is intended to include not only filaments but other products obtainable by extrusion.

What I claim and desire to secure by Letters Patent is:—

1. Process for the production of artificial silk filaments by extruding a solution of an organic derivative of cellulose in a solvent medium into an evaporative medium, comprising applying to the filaments in the course of their production a current of compressed air at a point along their length in such a manner as to exert an ejector action on the filaments and propel them at a speed greater than that of their extrusion.

2. Apparatus for the production of artificial silk filaments by the dry spinning method, comprising a spinning cell, a jet in said cell, and means for applying a current of compressed air to the filaments extruded from the jet at a point along their length in such a manner that the filaments are propelled at a speed greater than that of their extrusion and are thereby stretched and reduced in denier.

3. Process for the production of artificial filaments by extruding a solution of cellulose acetate into an evaporative medium, comprising applying to the filaments at a point along their length a gaseous stream in such a manner as to exert an ejector action on the filaments, which stream in direction and speed is independent of any motion of the evaporative medium, whereby the stream propels the filaments in the direction of their travel at a speed greater than that of their extrusion so as to stretch the filaments and reduce them in denier.

4. Process for the production of artificial filaments by extruding a solution of cellulose acetate into an evaporative medium, comprising applying to the filaments at a point along their length a stream of compressed air in such a manner as to exert an ejector action on the filaments, which stream in direction and speed is independent of any motion of the evaporative medium, whereby the stream propels the filaments in the direction of their travel at a speed greater than that of their extrusion so as to stretch the filaments and reduce them in denier.

5. Apparatus for the production of artificial filaments by the dry spinning method comprising a spinning cell, a spinning jet in said cell, a pipe for supplying a gaseous stream, and a device attached to said pipe comprising two tubes having an annular space between and adapted to direct said stream onto the filaments extruded from said jet in the direction of their travel, the filaments being drawn through the inner tube and projected from the device by the action of the gaseous stream issuing from the device.

6. Apparatus for the production of artificial filaments by the dry spinning method comprising a spinning cell, a spinning jet in said cell, a pipe for supplying a gaseous stream into said cell, and a device attached to said pipe comprising two tubes having an annular space between and adapted to direct said stream onto the filaments extruded from said jet in the direction of their travel, the filaments being drawn through the inner tube and projected from the device by the action of the gaseous stream issuing from the device.

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