

Oct. 2, 1945.

P. J. HAYES

2,385,856

LARGE RECTANGULAR SPINNERET

Filed Oct. 30, 1943

3 Sheets-Sheet 1

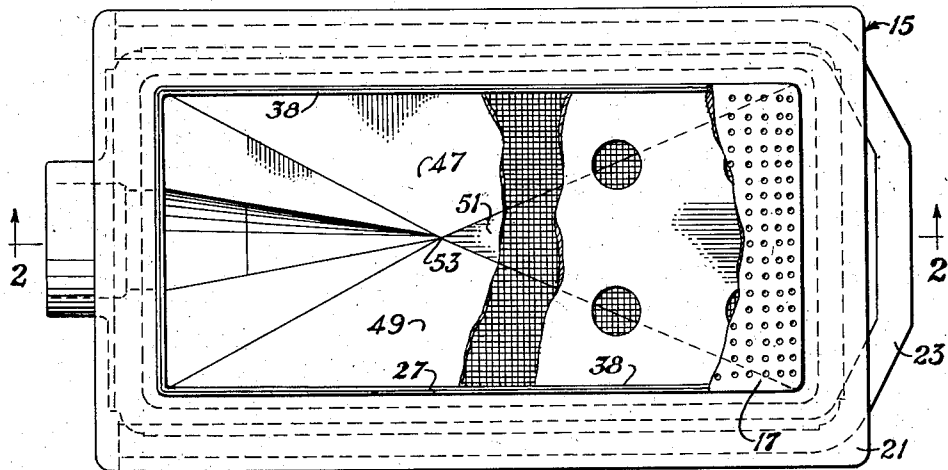


Fig. 1

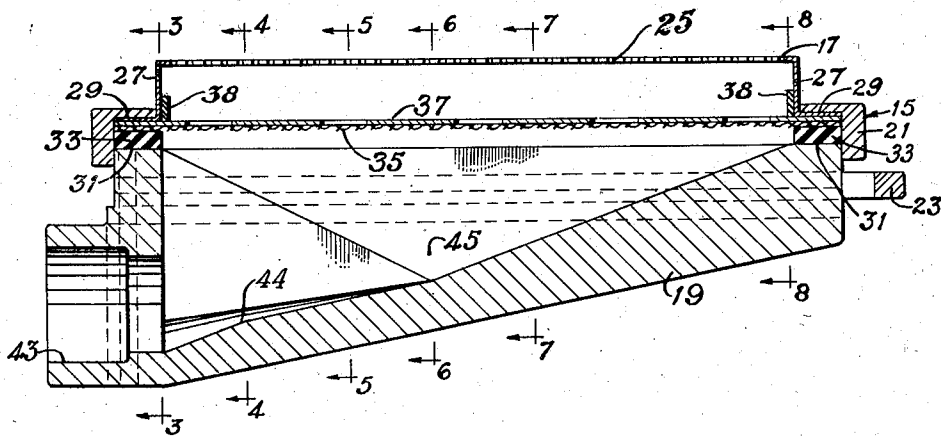


Fig. 2

Paul J. Hayes INVENTOR.

BY *Louis A. Wick*
ATTORNEY

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P. J. HAYES

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3 Sheets-Sheet 2

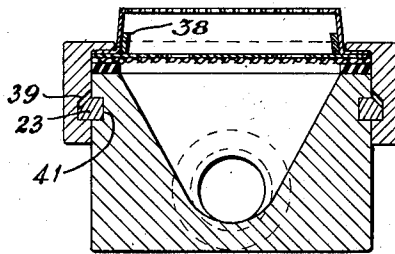


Fig. 3

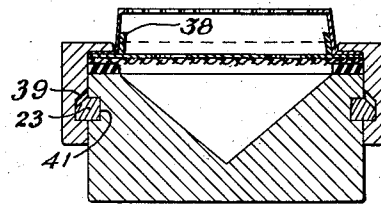


Fig. 6

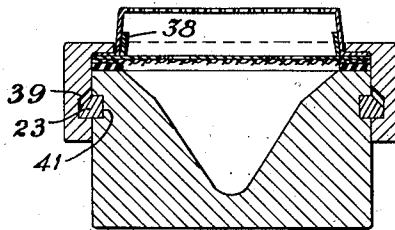


Fig. 4

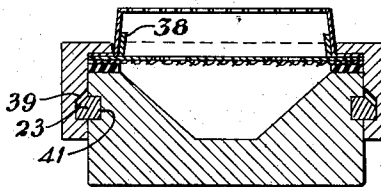


Fig. 7

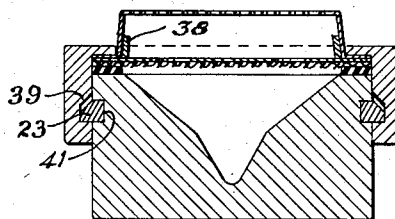


Fig. 5

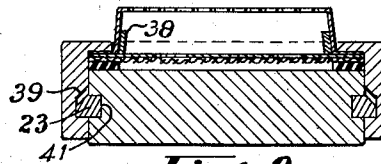


Fig. 8

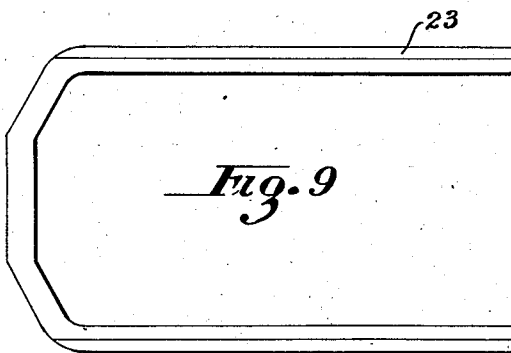


Fig. 9

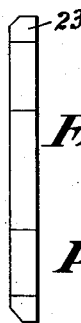


Fig. 9b

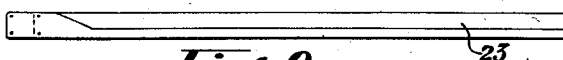


Fig. 9a

Paul J. Hayes
INVENTOR.

BY *James A. White*
ATTORNEY

Oct. 2, 1945.

P. J. HAYES

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3 Sheets-Sheet 3

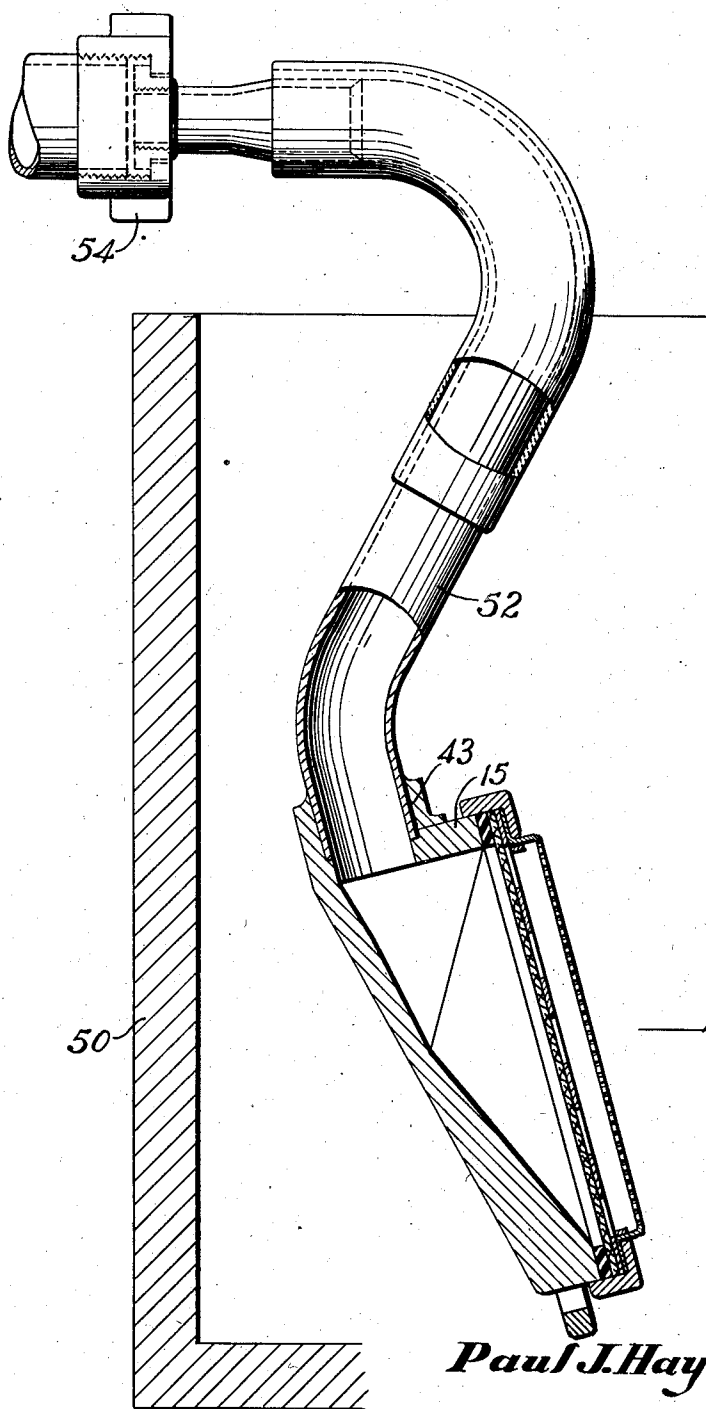


Fig. 10

Paul J. Hayes INVENTOR.

BY *Louis A. White*
ATTORNEY

UNITED STATES PATENT OFFICE

2,385,856

LARGE RECTANGULAR SPINNERET

Paul J. Hayes, Kenmore, N. Y., assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware

Application October 30, 1943, Serial No. 508,331

3 Claims. (Cl. 18-8)

This invention relates to the production of artificial filaments, and more particularly it relates to a new and improved rectangular spinneret capable of extruding an exceedingly large number of filaments of uniform size and physical characteristics.

In the conventionally used apparatus for the spinning of artificial filaments, a metering pump is connected between a source of supply of a filament-forming composition, and a spinneret. The metering pump forces the filament-forming composition through the spinneret at a constant rate per given period of time. The filament-forming composition must be forced through each and every orifice in the spinneret with substantially the same pressure in order that the resultant filaments issuing from the spinneret will all have the same size and physical characteristics. This has been readily accomplished by the general use of circular spinnerets comprising a circular face plate having a plurality of orifices and an adaptor, or approach chamber, having a circular shape through which the filament-forming composition passes as it approaches the face plate. By the use of a spinneret comprising a circular face plate and a circular approach chamber the filament-forming composition will be pressed through each orifice in the face plate with substantially the same pressure.

Such conventionally used circular spinnerets cannot be successfully used, however, when it is desired to have an exceedingly large number of orifices, i. e., 10,000 or more orifices, in the spinneret face plate. With such an exceedingly large number of orifices substantially uniform coagulation of all the filaments is not possible and the diameter of the circular face plate will be so great that it will flex and bulge to an objectionable degree as a result of the pressure on the filament-forming composition. If sufficiently thick material is used in constructing the face plate to withstand the pressure without excessive flexing, orifices of a uniformly fine size cannot be made therein. If the face plate is provided with reinforcing means, the latter will objectionably interfere with the flow of the filament-forming composition, resulting in excessive non-uniformity of the filaments.

Rectangular-shaped spinnerets have been disclosed heretofore but their use has not met with favor in view of the great difficulty in effectively sealing the several parts of the spinneret and in passing the filament-forming composition to the several orifices under the same pressure. The difficulties encountered with previously known

rectangular spinnerets have been due to inability to provide the same with a suitable adaptor, or approach chamber and seal the perforated face plate thereto. As a result of sharp changes in direction of flow of the filament-forming composition through such previously known rectangular spinnerets, the composition failed to reach all of the orifices under the same pressure. As a result, the filaments extruded through orifices varied so greatly in denier as to be of little commercial value.

It is therefore an object of this invention to provide an improved rectangular spinneret having 10,000 or more orifices, and comprising means for passing the filament-forming composition to all of said orifices at substantially the same pressure.

Other objects of the invention will appear hereinafter.

The objects of this invention are accomplished, in general, by constructing a spinneret with a rectangular face plate and an approach chamber having the shape of a pyramid, the base of which is positioned near, and open to said face plate and one side of which is open to an inlet port. It has been found that a rectangular spinneret constructed in this manner will function to pass the filament-forming composition to the face plate with a uniform pressure at all points thereof.

The details of the invention will be more clearly apparent by reference to the following detailed description when taken in connection with the accompanying illustrations, in which:

Fig. 1 is a top plan view, with parts broken away, of a spinneret constructed in accordance with the invention.

Fig. 2 is a sectional view taken along the line 2-2 of Fig. 1.

Figs. 3, 4, 5, 6, 7 and 8 are sectional views taken along the lines 3-3, 4-4, 5-5, 6-6, 7-7, and 8-8 respectively, of Fig. 2.

Figs. 9, 9a and 9b are top plan, side elevational and end elevational views respectively, of a key for keying the spinneret cap to the adaptor.

Fig. 10 is a diagrammatic side elevational view, with parts shown in section, of a spinneret positioned within a setting bath.

Referring to the drawings, reference numeral 15 designates, generally, a spinneret comprising a spinneret cap 17, an adaptor 19, a flanged clamping ring 21 and a fastening key 23.

The spinneret cap 17 is comprised of a face plate 25 containing 10,000 or more orifices, side walls 27, and attachment flanges 29. The at-

tachment flanges 29 are clamped against the peripheral edge 31 of the adaptor 19, with the interpositioning therebetween of a rubber gasket 33, one or more layers of a filter fabric 35, and a perforated filter support 37. These various parts are clamped together by fitting the flanged clamping ring 21 over the several parts as illustrated in Figs. 2 to 8, applying pressure thereto and sliding the fastening key 23 into the aligned grooves 39 and 41, respectively in the clamping ring and adaptor. (See Figs. 3 and 4.) The perforated filter support 37 may be provided with a flange 38 to reinforce the sidewalls 27 of the spinneret cap 17.

The adaptor 19 has an inlet port 43 for the filament-forming composition in one end thereof, and the inside of the adaptor comprises an approach chamber 45 having the form of a pyramid, the base of which is defined by the open edge 31 of the adaptor, and one face or side of which is entirely open to the inlet port 43. The other three sides or faces of the pyramidal chamber are defined by the triangular walls 47, 49 and 51, and the apex of the pyramidal chamber is at point 53 (see Fig. 1). In order that the requisite number of orifices may be placed in the face plate of the spinneret cap without flexing or bulging, it is preferred that the rectangular face plate have a length at least 2 times its width.

Figs. 3 to 8 inclusive, clearly show the progressively varying cross-sectional shapes of the approach chamber 45. From these illustrations it will be seen that the approach chamber has a progressively shallower, substantially V-shaped cross-section from the inlet port to the approximate center of the chamber, and a progressively shallower trapezoidal cross-section from the approximate center of the chamber to the end thereof opposite said inlet port. The spinning composition passing into the adaptor from the inlet port contacts a sloping bottom or "hump" 44 (see Fig. 2), which is adapted to deflect the spinning composition upwardly to insure adequate flow to the spinneret openings directly above the inlet port.

The various parts of the spinneret may be quickly assembled as follows. The spinneret cap 17 is placed within the rectangular opening of flanged clamping ring 21. The filter support 37 is then placed on the flanges 29 of the spinneret cap 17 and the filter cloth 35 is laid over the filter support 37. The rectangular yieldable gasket 33 is then laid on the filter cloth. The adaptor 19 is then placed on the gasket 33, and sufficient force is exerted by mechanical or hydraulic means, for example, by means of an assembly jig, between the clamping ring 21 and adaptor 19 to thereby firmly compress the gasket 33 thus aligning grooves 39 and 41. The key 23 is then slid into the aligned grooves. When the pressure is released, the compression of the yieldable gasket 33 is sufficient to hold the parts tightly clamped in contact with each other.

Referring to Fig. 10 of the drawings, the spinneret 15 is positioned in a setting bath contained in tank 50. The inlet port 43 of the spinneret 15 is fastened to a spinning composition conduit 52 in any desired manner, such as by welding, soldering or a threaded fitting. The S-shaped conduit 52 may be provided with a suitable coupling 54 to permit ready removal of the spinneret from bath tank 50.

By means of the present invention, it is possible to spin a great number of filaments having a uniform size from a single spinneret having a

large face area. It has been found that a spinneret constructed in accordance with the present invention may have a total face area of 5 or 6 or more square inches and may contain from 5,000 to 30,000 or more orifices, and yet produce filaments of uniform size and physical characteristics. By reason of the above described pyramidal shape of approach chamber and the distributing hump, the filament-forming solution will pass to all of the many orifices with substantially identical pressure and without forming cross-current eddies and voids within the spinneret. The spinneret of the present invention may be used with any known spinning composition, for example, a spinning composition comprising viscose, cuprammonium cellulose, cellulose acetate, a synthetic linear polyamide, a protein or the like.

Since it is obvious that many changes and modifications can be made in the above described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited to the above described details except as set forth in the appended claims.

I claim:

1. A spinneret of substantially rectangular outline comprising a substantially rectangular spinneret face plate containing orifices therein, a spinneret adaptor containing an approach chamber having the shape of a pyramid the base of which is open and one side of which is connected to an inlet port, a hump being provided between said inlet port and said pyramid for deflecting the incoming filament-forming composition towards said spinneret orifices and means for connecting said spinneret face plate to said open base of said pyramidal chamber.

2. A spinneret of substantially rectangular outline comprising a spinneret cap including a substantially rectangular spinneret face plate containing orifices therein, side walls integral with said face plate and attachment flanges projecting outwardly from said side walls, a spinneret adaptor containing an approach chamber having the shape of a pyramid the rectangular base of which is open and one triangular side of which is connected to an inlet port, a hump being provided between said inlet port and said pyramid for deflecting the incoming filament-forming composition towards said spinneret orifices and means for connecting said attachment flanges to said open rectangular opening of said pyramidal chamber.

3. A spinneret of substantially rectangular outline comprising a spinneret cap including a substantially rectangular spinneret face plate, side walls integral with said face plate and attachment flanges projecting outwardly from said side walls, a spinneret adaptor having a substantially rectangular open side, an inlet port in one end of said spinneret adaptor, means for fastening the attachment flanges to the open side of said spinneret adaptor thereby forming an approach chamber in said adaptor between said inlet port and said spinneret face plate, the approach chamber having a progressively shallower substantially triangular cross-section from the inlet port to the approximate center of the chamber broken by a distributing hump, and having a progressively shallower trapezoidal cross-section from the approximate center of the chamber to the end thereof opposite said inlet port.

PAUL J. HAYES.