

Aug. 19, 1941.

P. J. HAYES

2,253,073

THREAD PRODUCTION

Filed Feb. 8, 1940

Fig. 4

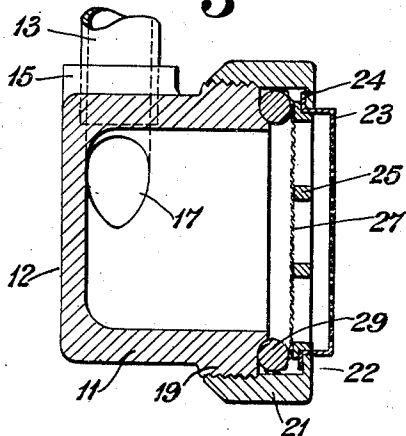


Fig. 1

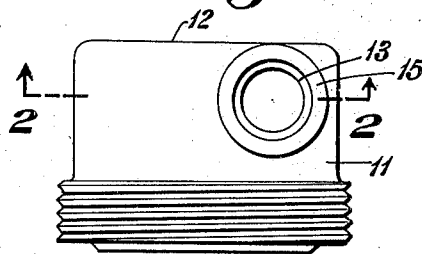


Fig. 3

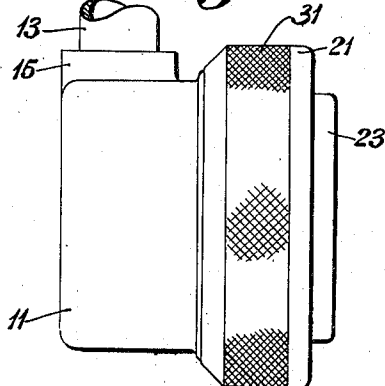


Fig. 2

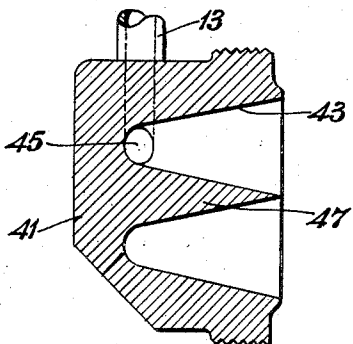
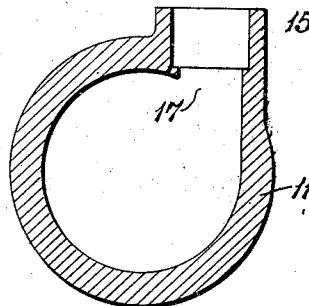
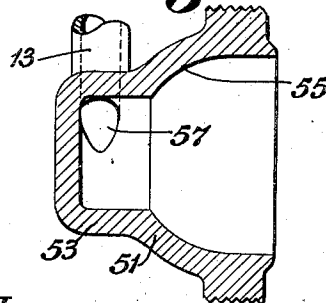


Fig. 5

Fig. 6



Paul J. Hayes

INVENTOR

BY *Louis Weber*
ATTORNEY

UNITED STATES PATENT OFFICE

2,253,073

THREAD PRODUCTION

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

Application February 8, 1940, Serial No. 317,827

4 Claims. (Cl. 18—8)

This invention relates to the production of artificial filaments, and more particularly it relates to an improved apparatus for adapting, or connecting, a spinneret to a supply conduit for a liquid filament-forming composition.

In the spinning of artificial filaments from viscose, cuprammonium cellulose, Nylon, cellulose acetate, and other filament-forming compositions, it is the conventional practice to pump the composition through a supply conduit to the spinneret. The spinneret is usually fixed to the conduit by connecting one end of a small housing or chamber to the conduit, and mounting the spinneret in the opposite end of said housing. The housing connecting the supply conduit with the spinneret is referred to as a "spinneret adapter."

The previously known construction, wherein the supply conduit is connected to one end of the spinneret adapter and the spinneret is mounted in the opposite end thereof, functions in a sufficiently satisfactory manner when the face of the spinneret does not exceed about one inch in diameter. In the spinning of large bundles of artificial filaments, for example in the production of staple fibers, it is very desirable to employ large spinnerets containing from 5,000 to 10,000 or more holes for the extrusion of filaments. Such large spinnerets must necessarily be constructed with a minimum face diameter of $1\frac{5}{8}$ inches.

Great difficulty has been encountered in securing satisfactory spinning, when using spinnerets having a minimum face diameter of $1\frac{5}{8}$ inches, with previously known spinneret adapter constructions.

It has been discovered that the composition passing through the supply conduit and the adapter moves considerably faster through the center of these members than at the side walls thereof. As a consequence, the composition moves faster through the holes at the center of the spinneret than through the holes adjacent the outer edges of the spinneret. As a result the filaments extruded from the spinneret vary considerably from each other in denier. The filament bundle, taken as a whole, has a harsh non-uniform appearance and is often termed "wormy" or "lumpy." The sections near the walls of the adapter back of the spinneret were spoken of as dead spots, since the solution moved more slowly through these areas. Various attempts were made to eliminate these so-called dead spots, for example by the use of baffles which served to some extent to break up the higher

pressure exerted against the center of the spinneret, and also by means of different types of adapters. In all cases, however, the plane of the spinneret was maintained perpendicular to the flow of the solution.

By these attempts, it was found possible to obtain somewhat more satisfactory spinning when spinnerets having a face diameter of not more than $1\frac{5}{8}$ inches, and having not more than 3200 holes were used. It was found impossible, however, to obtain satisfactory spinning by means of these improvements when using spinnerets having a larger face diameter.

It is, therefore, an object of this invention to provide an improved construction of spinneret adapter.

It is another object of this invention to provide an improved construction of spinneret adapter which will direct a filament-forming composition with a substantially uniform velocity and pressure against the internal surface of a spinneret face plate.

It is another object of this invention to provide an improved construction of spinneret adapter which will direct a filament-forming composition through the holes of a spinneret with a substantially uniform velocity and pressure.

It is still another object of this invention to provide an improved construction of spinneret adapter which will make it possible to use spinnerets of a large face diameter.

Other objects of the invention will appear hereinafter.

The objects of the invention are accomplished, in general, by providing an apparatus which is adapted to move the filament-forming solution toward the spinneret face with a spiral motion.

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

Figure 1 is a top plan view of a spinneret adapter constructed in accordance with the present invention.

Figure 2 is a section taken along the line 2—2 of Figure 1.

Figure 3 is a side elevational view of the spinneret adapter shown in Figure 1 and containing a spinneret mounted on one end thereof.

Figure 4 is a sectional side view of a spinneret adapter, spinneret and supply conduit showing the relative positions of the various parts.

Figure 5 is a sectional side view of a modified form of spinneret adapter.

Figure 6 is a sectional side view of still another modified form of spinneret adapter.

Referring to Figures 1 to 4 of the drawing, reference numeral 11 designates generally a spinneret adapter which comprises essentially a housing having a substantially cylindrical internal side wall with a closed bottom 12 and an open top in which a spinneret is to be mounted. A supply conduit 13 is mounted in a supply conduit connection 15, the connection 15 being tangentially positioned in the side wall of the adapter. The opening 17 between the supply conduit connection and the side wall of the adapter is positioned tangentially to the internal cylindrical side wall of the adapter as shown in Figures 2 and 4. The open top of the adapter 19 is provided with external threads whereby an annular flanged member 21 having internal threads may be connected to the open top of the adapter. A spinneret 23 is held on the open top of the adapter by means of cooperating flanges 22 and 24 provided respectively on the flanged member 21 and a spinneret. A sealing ring 29, a filter cloth 27, and a filter cloth supporting member 25 are positioned between the flange 24 of the spinneret and the open top of the spinneret adapter. The spinneret 23 as well as the support 25, the cloth 27 and the sealing ring 29 are firmly pressed against the end surface of the wall surrounding the open top of the adapter by tightening the flanged member 21. The flanged member 21, if desired, may be provided with knurling 31 on the peripheral surface thereof so that the flanged member 21 may be screwed tightly on to the threaded portion of the spinneret adapter.

Referring to the modification shown in Figure 5, the spinneret adapter 41 is provided with a substantially cylindrical internal surface 43 which may, if desired, be slightly flared as illustrated. The conduit 13 is connected to the adapter housing 41 tangentially similar to the connection shown in Figures 1 to 4. A conical projection 47 is positioned on the bottom surface of the adapter housing so as to accentuate the spiral movement of the filament-forming solution passing into the adapter and moving towards the spinneret face.

In the modification shown in Figure 6, the spinneret adapter 51 comprises a substantially cylindrical section 53 and a substantially circular outwardly flared section 55. The conduit 13 is connected to the adapter housing in the side wall thereof at a tangential angle similar to the construction shown in Figures 1 to 4.

The spinneret may be conveniently assembled with the adapter housing in the following manner: The flanged member 21 is positioned on a ring support. The spinneret 23 is then inserted in the flanged members so that the flanges 22 and 24 are brought into cooperative connection with each other. The filter cloth support 25 is then placed on the flange 24 of the spinneret. The filter cloth 27 is then placed over the flanged member 21 and is forced into position by pressing a sealing ring downwardly into the interior of the flanged member 21 and against the filter cloth support 25. The parts thus assembled are then screwed on to the externally threaded section 19 of the open top of the adapter. The filament-forming solution passing through the supply conduit into the conduit connection of the adapter moves into the adapter substantially on a

tangent to the inner circumference of the adapter housing. As a consequence the filament-forming solution passing towards the filter cloth or the face of the spinneret moves in a spiral flow. The spiral flow causes the solution to maintain a substantially constant and uniform pressure against all sections of the filter cloth and spinneret.

Obviously, there is considerable leeway to the tangential angle at which the filament-forming solution is passed into the adapter housing. In order to obtain a spiral flow of the filament-forming solution within the adapter housing, the connection must be such that it lies at an angle to a radius drawn from the center of the housing to the connection opening. The term "tangential" as used in the specification and claims is intended to cover the variations in structure which are possible to obtain a spiral flow of the solution in the adapter housing. While the invention is described in terms of an adapter having a substantially circular or cylindrical cross-section, it is obviously not so limited and other cross-sections, for example hexagonally- or octagonally-shaped cross-sections might also be used to advantage. The spinneret adapter should be constructed of a material which will not be corroded and which will not contaminate the filament-forming solution passing there-through.

The spinneret adapter of the present invention makes it possible to spin filaments from filament-forming solutions with spinnerets having a much larger face diameter and a greater number of holes than has heretofore been thought possible. By this construction a single position in a spinning machine may be used to spin from 5,000 to 10,000 or even a greater number of filaments. By the adoption of the spinneret adapter of the present invention, dead spots in the flow of the filament-forming solution toward and through the spinneret will be substantially eliminated.

Although the present invention is particularly adapted for use of spinnerets having a face diameter in excess of $1\frac{1}{8}$ inches, it is also quite advantageous in using spinnerets having a smaller face diameter.

By the use of the present invention a uniform flow of the viscose through all sections of the spinneret is obtained and there is less clogging of the holes in the spinneret thus permitting a longer spinning period before the spinnerets must be removed and cleaned.

Since it is obvious that many changes and modifications can be made in the details above described 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 details set forth except as defined in the following claims.

I claim:

1. A spinneret adapter comprising a housing, a spinneret mounted in one end of said housing, a plurality of filament-forming orifices in said spinneret, a supply conduit connection for a filament-forming solution in said housing, said supply conduit connection tangentially positioned in the side wall of said housing whereby the filament-forming solution is passed in a spiral direction through said housing and with substantially equal speeds through said orifices.

2. A spinneret adapter comprising a housing, the internal side wall of which is substantially cylindrical, a spinneret mounted in one end of said housing, a plurality of filament-forming ori-

5 fices in said spinneret, a supply conduit connection for a filament-forming solution in said housing, said supply conduit connection tangentially positioned in the side wall of said housing whereby the filament-forming solution is passed in a spiral direction through said housing and with substantially equal speeds through said orifices.

10 3. A spinneret adapter comprising a housing having a bottom, a top, and a substantially cylindrical internal side wall, a conical projection mounted on the internal bottom surface of said housing, a spinneret mounted on the top of said housing, a plurality of filament-forming orifices in said spinneret, a supply conduit connection for a filament-forming solution in said housing, said supply conduit connection tangentially positioned in the side wall of said housing whereby the fila-

ment-forming solution is passed in a spiral direction through said housing and with substantially equal speeds through said orifices.

5 4. A spinneret adapter comprising a housing having a bottom, a top, and a flared substantially circular internal side wall, a spinneret mounted on the top of said housing, a plurality of filament-forming orifices in said spinneret, a supply conduit connection for a filament-forming solution in said housing, said supply conduit connection tangentially positioned in the side wall of said housing whereby the filament-forming solution is passed in a spiral direction through said housing and with substantially equal speeds through said orifices.

PAUL J. HAYES.