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L. P. DEIS

2,932,084

METHOD OF MAKING SPINNERETS

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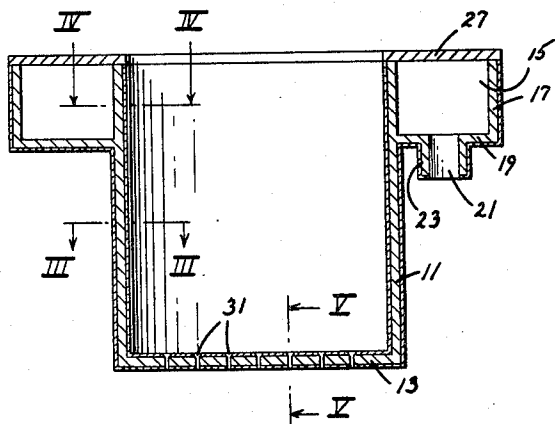


Fig. 2

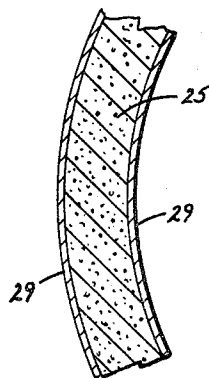


Fig. 3

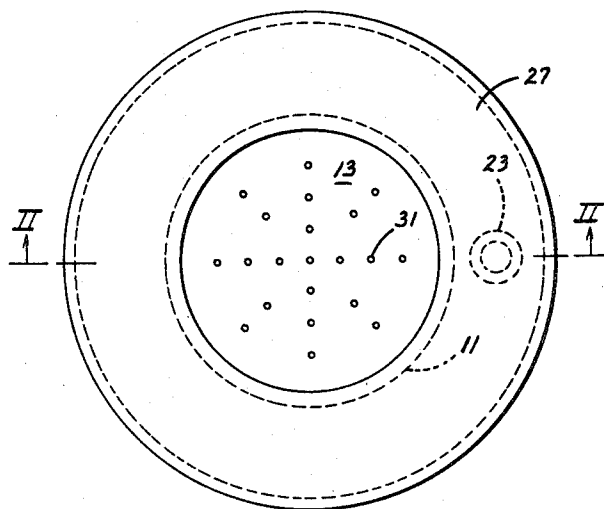


Fig. 1

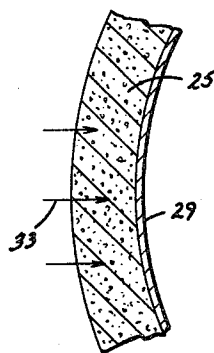


Fig. 4

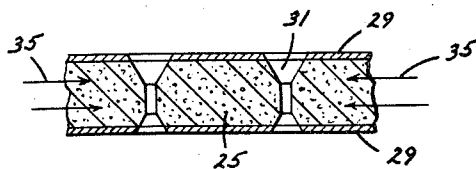


Fig. 5

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METHOD OF MAKING SPINNERETS

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7 Claims. (Cl. 29—460)

The invention relates to the method of making spinnerets. Particularly, the invention is concerned with the method of making self-cleaning spinnerets which are adapted to apply various finishing, colorant or additive solutions to the material extruded through the capillaries or openings of the spinnerets. This application is a division of my United States Patent application 509,349 entitled Spinneret, and filed May 18, 1955.

In the spinning of filament-forming solutions, especially cellulose acetate, considerable difficulty is often encountered in starting the spinning solutions flowing through the spinneret capillaries to form a continuous and perfect strand. The capillaries, being of very small diameter, are not readily and satisfactorily cleaned by known methods, and thus most any small fragment of foreign matter clinging to the walls of any one of the capillaries will cause the solutions extruded therethrough to flow as a viscous mass along the face of the spinneret, rather than being extruded as a continuous strand or filament. This undesirable action on the part of the extruded solutions disrupts the continuity of the fluid extruded through the other capillaries, necessitating the cleaning or replacement of the spinneret itself.

Further, it is often desirable to have the extruded strand possess a certain finish, color, or other characteristic which is imparted to the filament-forming solutions by the use of various additives or colorants. Normally these additives and colorants are incorporated into the mixer in which the filament-forming solution is first formed, or are intermixed with the filament-forming solution after its formation and before its extrusion through the spinneret. However, these known methods of imparting desirable properties to the filamentary strand render it difficult to maintain control over the quality of the particular characteristic imparted to the filament and also lack flexibility, as for example when filamentary strands having treated sections of relatively short length are desired. It is therefore an object of the invention to provide a generally new or improved and more satisfactory method for making spinnerets having greater utility than those heretofore known.

Another object is to provide a method of making a spinneret having capillaries which may be flushed clean without removal of the spinneret from its operating position.

Still another object is the provision of the method of forming a spinneret having a porous internal structure through which flushing, colorant, and additive fluids may be forced to and through the capillary walls.

A further object is the provision of a method of making a spinneret having an integral fluid supply chamber from which various flushing, colorant, or additive solutions may be forced through the porous interior structure of the spinneret to the spinneret capillaries.

These and other objects and advantages of the invention will be apparent from the following description and accompanying drawing in which:

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Fig. 1 is a top view of a spinneret made in accordance with the present invention;

Fig. 2 is a central vertical section taken on the line II—II of Fig. 1;

Fig. 3 is a fragmentary horizontal section, on an enlarged scale, taken through the wall of the spinneret along the line III—III of Fig. 2;

Fig. 4 is a section similar to Fig. 3 taken along the line IV—IV of Fig. 2; and

Fig. 5 is a fragmentary vertical section, on an enlarged scale, taken through the face of the spinneret along the line V—V of Fig. 2.

A spinneret made by the method of the present invention resembles a conventional spinneret in shape, with the addition of a fluid receiving chamber or trough extending around its exterior periphery. The exposed surfaces of the annular wall and face of the spinneret, and walls of the fluid receiving chamber are coated with a thin layer of impervious material, while the internal structure of the assembly is porous so as to permit the flow of fluid therethrough. The spinneret openings or capillaries are formed after the exposed surfaces have been coated, so that the major portion of the capillary walls are defined by the porous structure of the spinneret face. Fluid under pressure is adapted to flow freely from the chamber through the porous internal structure of the spinneret to the capillary walls to flush the same of any foreign matter, or to be applied to the filament-forming material extruded therethrough.

As shown in the drawings, the spinneret has a conventional cup-shaped body including an annular or tubular wall 11 and a face 13 integrally formed by sintering a powdered material, as for example stainless steel particles, under high temperature and pressure in a suitably shaped mold. Extending around the external periphery of the annular wall 11, adjacent to its inlet end, is a circular fluid receiving chamber or trough 15 having a side wall 17 and a bottom wall 19, with the wall 19 provided with a fluid inlet opening 21 defined by a collar 23. Any suitable means, as for example external threads, may be provided on the collar 23 to facilitate attachment of fluid conduit means thereto. The walls 17 and 19 are also fabricated by sintering, under high temperature and pressure, a powdered material of the same type as employed in the spinneret body, and may be formed either integrally with the spinneret body or as a separate unit, with the first mentioned procedure being preferable. The sintering procedure employed provides the spinneret body and chamber walls with a strong but porous structure, as shown at 25, through which fluids, under pressure, are able to flow. The strength of these members and the rate at which they conduct fluids may be readily controlled by the particle size of the powdered material and sintering temperatures and pressures.

The top of the chamber 15 is formed by an annular plate 27 fastened, in a fluid-tight manner, to the walls 11 and 17 of the spinneret assembly. The plate 27 need not be of porous construction and is preferably formed of a material, for example stainless steel, not readily attacked by the solutions normally employed. All of the exposed surfaces of the spinneret assembly are then coated or plated with a thin layer 29 of impervious material, as for example stainless steel, while the inlet opening 21 is temporarily sealed with a suitable stopper, after which the openings or apertures or capillaries 31 are formed in the spinneret face 13. By punching the capillaries 31 after the assembly has been coated, it will be evident that the major portion of the capillary walls are defined by the internal porous structure of the face 13. From the structure described thus far, it is seen that fluid forced into the chamber 15, after its temporary seal is removed, is adapted to flow along the porous internal

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structure of the annular wall 11 and face 13 to the capillaries 31, as shown by the arrows 33 and 35 in Figs. 4 and 5, and is confined to its path by the impervious exposed surfaces 29 on either side of the porous internal structure.

With regard to the walls 17 and 19 of the chamber 15, it will be noted that their internal surfaces remain uncoated and therefore fluid from the chamber can pass through these walls to the wall 11 of the spinneret, in addition to the direct passage to the wall 11 as shown in Fig. 4. The walls 17 and 19 of the chamber are preferably sintered simultaneously with the wall and face of the spinneret since forming these elements as a unit separate from the spinneret body requires extreme care to prevent blocking of the porous structure of the wall 11 at the point of connection of the walls 11 and 19.

In use, the fluid is forced by any suitable manner, not shown, through the inlet opening 21 into the chamber 15. Sufficient pressure is employed to force the fluid as above described to the capillary walls so as to flush the same of any foreign matter. After flushing, other fluids may be forced into the chamber 15 and caused to flow along the wall 11 and the face 13 to the capillaries, and impart to the filament-forming solutions extruded therethrough, any desirable finish or color. It is seen that the additive fluid can be changed when desired without in any way stopping or altering the extrusion of the filament-forming material through the spinneret capillaries, and thus the spinneret provides excellent flexibility when filaments of various characteristics are desired.

It is seen from the above description that the objects of the invention are well fulfilled by the method described. The description is intended to be illustrative only and it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. A method of producing a spinneret for use in making filaments including the steps of forming a cup-shaped member having a porous fluid permeable structure, covering an exposed portion of the fluid permeable structure, applying a fluid impermeable coating on the remaining exposed surfaces of the member to confine the fluid permeable structure of said member between a pair of fluid impermeable surfaces, and perforating a coated portion of the member with a plurality of apertures extending in a direction approximately parallel to its axis whereby liquid delivered through the uncoated por-

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tion of said member may permeate through the confined portion of the porous structure and at least surface-treat filament-forming material as it is extruded through the apertures.

2. A method as defined in claim 1 wherein said porous fluid permeable structure is formed by sintering metal powders under pressure.

3. A method as defined in claim 2 wherein said fluid impermeable coating is metallic.

4. A method of producing a self-cleaning spinneret for use in making filaments including the steps of forming a porous cup-like member having a channel-shaped trough extending circumferentially along its exterior surface, securing an annular cover to the trough over its open end, applying a fluid impermeable coating on exposed surfaces of the member to confine the porous structure of said member between a pair of fluid impermeable surfaces, and perforating a coated portion of the member with a plurality of apertures extending in a direction approximately parallel to its axis whereby liquid from said channel-shaped trough may permeate through the confined porous structure of said member and pass through the walls of the apertures to flush the same.

5. A method as defined in claim 4 wherein said porous fluid permeable structure is formed by sintering metal powders under pressure.

6. A method as defined in claim 5 wherein said fluid impermeable coating is metallic.

7. A method of producing a self-cleaning spinneret for use in making filaments including the steps of forming a cup-like member having a porous fluid permeable structure, applying an impermeable coating on exposed surfaces of the member to confine the fluid permeable structure of said member between a pair of fluid impermeable surfaces and perforating the coated member with a plurality of extrusion apertures extending in a direction approximately parallel to its axis whereby liquid delivered to the confined fluid permeable structure of said member flows therethrough to the walls of the apertures for at least surface-treating filament-forming material as it is extruded.

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