

June 15, 1971

YUTAKA KAMACHI ET AL

3,584,339

SPINNERET FOR BOTH COMPOSITE AND ORDINARY FIBERS

Filed July 14, 1969

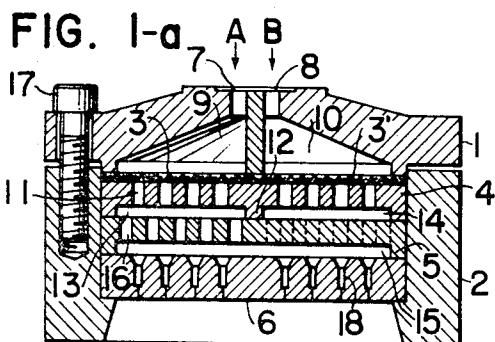


FIG. 1-b

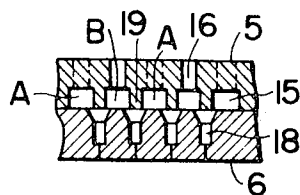


FIG. 2

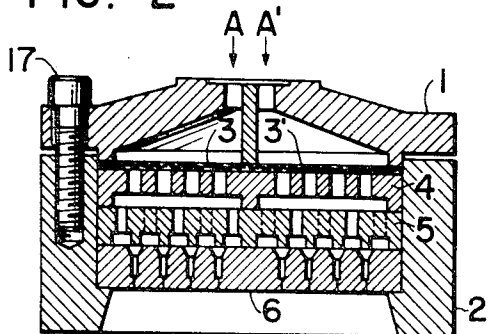


FIG. 4

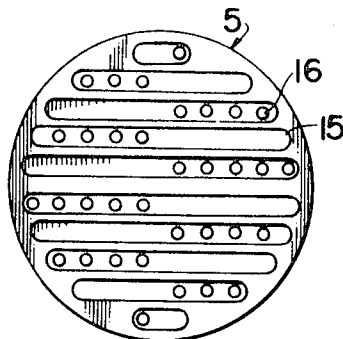
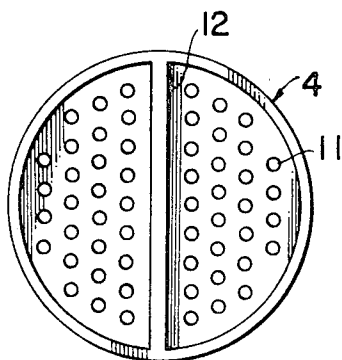


FIG. 3



1

3,584,339

SPINNERET FOR BOTH COMPOSITE AND ORDINARY FIBERS

Yutaka Kamachi and Shigeyuki Miwa, Shiga-ken, Japan,
assignors to Chisso Corporation, Osaka, Japan
Filed July 14, 1969, Ser. No. 841,426
Int. Cl. D01d 3/00

U.S. Cl. 18—8

1 Claim

ABSTRACT OF THE DISCLOSURE

A novel spinneret useful for both composite and ordinary fibers comprising right and left reservoirs for two kinds of fiber-forming liquid and right and left filters therefor; a filter-reinforcing plate having holes divided into right and left groups and for introducing fiber-forming liquids after filtration into right and left hand liquid distribution chambers, which are formed as hollow spaces on the back surface of the plate; a distribution plate having holes for distributing the liquids from the chambers into straight, distributing grooves formed on the back surface of the plate, at equal intervals and in parallel with each other, the liquid from the right and left chambers being alternately distributed into subsequent grooves; and a nozzle plate having spinning holes positioned under the middle part of each two adjacent grooves and opened to each of the said two adjacent grooves to receive the liquids from both of the said two adjacent grooves and further arranged so that each hole can form a square having the pitch same with the distance between two adjacent grooves, whereby the two kinds of liquid extruded from the holes can form composite fibers and if the distribution plate is rotated by 90°, they can form ordinary fibers.

The present invention relates to a novel spinneret, and particularly it relates to a spinneret capable of extruding and spinning any of ordinary and composite fibers.

It has heretofore been considered impossible in the production of man-made fibers carried out by extrusion and spinning to form any of ordinary and composite fibers by means of the same spinning apparatus and spinneret.

Namely, since the spinning method for producing composite fibers usually comprises preparing fiber-forming liquids of two different kinds of high molecular weight substances separately and leading them into common spinning nozzles, the structures of apparatus and spinneret are so complicated that various limitations are necessitated compared with the method for producing ordinary fibers by spinning fiber-forming liquid of only one kind of high molecular substance.

For example, there are such drawbacks as lowering of production efficiency resulting from the decrease of spinning holes due to complicated spinneret, difficulty of installing of filter, complicated structure of the filter even when it could be installed, and markedly smaller filtration area.

In addition to these drawbacks, if ordinary fibers are to be spun by the use of the apparatus and spinneret for spinning composite fibers, regular fibers cannot be obtained, because each fiber-forming liquids turn to have different properties such as brittle point, etc., depending upon differences in conditions such as temperature encountered during the course down to spinning holes. This is caused because fiber-forming liquids of the same high molecular substance are separately prepared and led to the same spinning holes.

An object of the present invention is to provide a spinneret capable of spinning any of ordinary and composite fibers with a high efficiency in which as many holes are bored as in case of spinneret for ordinary fibers.

2

Another object of the present invention is to provide a spinneret capable of affording two kinds of ordinary fibers simultaneously.

These objects can be attained by the spinneret of the present invention.

In brief, the present invention consists in a spinneret useful for both composite and ordinary fibers comprising right and left reservoirs for two kinds of fiber-forming liquid and right and left filters therefor; a filter-reinforcing plate, placed just under the filter, which has holes divided into right and left groups, to introduce fiber-forming liquids after passing through the filters into right and left chambers for distributing fiber-forming liquids which are formed as follow spaces on the back surface of the filter-reinforcing plate; a perforated distribution plate; placed just under said filter-reinforcing plate, which has holes for distributing fiber-forming liquids from said right and left chambers into straight, distributing grooves formed on the back surface of the perforated distribution plate and arranged at equal intervals, in parallel and in the direction perpendicular to the boundary between the right and left groups, the fiber-forming liquid from the right and left chambers being alternately distributed into subsequent grooves; and a nozzle plate placed just under said perforated distribution plate and having spinning holes positioned under the middle part of each two adjacent grooves and opened to each of said adjacent grooves to receive fiber-forming liquids from both of said two adjacent grooves, and further arranged so that each of the spinning holes form a square configuration having the pitch same with the distance between two adjacent grooves, whereby the two kinds of fiber-forming liquid extruded from the holes can form composite fibers and if said perforated distribution plate is rotated by 90°, they can form ordinary fibers.

The spinneret of the present invention and an embodiment thereof will hereinafter be illustrated referring to the accompanying drawings.

FIG. 1-a is an elevational cross section of the spinneret of the present invention viewed from the front in case where it is set for spinning composite fibers.

FIG. 1-b is a part of the elevational cross section of the spinneret viewed from the said and showing the relationship of straight, distributing grooves of the spinneret with spinning holes.

FIG. 2 is an elevational cross section of the spinneret viewed from the front in case where it is set for spinning ordinary fibers.

FIG. 3 is a plan of the back surface of a filter-reinforcing plate constituting the spinneret of the present invention, and

FIG. 4 is a plan of the back surface of a distribution plate constituting the spinneret of the present invention.

In FIG. 1-a, fiber-forming liquids A and B enter right and left inlets for the liquids 7 and 8 formed in a covering plate 1 and are introduced through the corresponding right and left reservoirs for fiber-forming liquids 9 and 10, right and left filters 3 and 3' and introducing holes 11, into right and left chambers for distributing fiber-forming liquids 13 and 4. Filters may be preferably used which are a net of metal partitioned right and left, whereby the filters have almost the same filtration area with that of spinneret for spinning ordinary fibers and become simple in form and low in cost.

The right and left chambers for distributing fiber-forming liquids 13 and 14 are formed on the back surface of the filter-reinforcing plate 4 and have a partition 12 between them. Introducing holes 11 for leading each fiber-forming liquid after passing through the filters are bored in the filter-reinforcing plate so that they are divided into two right and left groups. FIG. 3 is a plan of the back surface of the filter-reinforcing plate, which

illustrates a state in which introducing holes 11 are arranged so that they can be divided by the partition 12 into equal right and left groups. It goes without saying that the number and arrangement of the introducing holes are not always necessary to be equal in the right and left sides, but they can be optionally installed so long as they are within the range where the object of the present invention can be attained.

Fiber-forming liquids A and B introduced into the chambers for distributing fiber-forming liquids 13 and 14, are then introduced through distributing holes 16 bored in the distribution plate 5, into straight, distributing grooves 15 formed on the back surface of the distribution plate 5. As shown in FIG. 4, the straight, distributing grooves 15 are formed on the back surface of the distribution plate, at equal intervals and in parallel with each other with a proviso that the interval between the two adjacent grooves lying in the middle is not necessarily the same with the interval between two grooves of other parts. The distributing holes 16 are so installed that hole or holes communicating with the chamber 13 for distributing the liquid A and hole or holes communicating with the chamber 14 for distributing the liquid B, communicate alternately with subsequent grooves of the above-mentioned grooves. For example, the liquid A enters and fills the groove 15 positioned in the second row counting from the top of FIG. 4 through three distributing holes 16 perforated in the left half part of the groove, which the liquid B enters and fills the groove positioned in the third row through four distributing holes perforated in the right half of the groove, and so on. The number of the distributing hole or holes in one groove is usually one to several according to the length of the straight, distributing grooves, as seen in FIG. 4. The liquids thus introduced into the straight, distributing grooves are taken out from two adjacent grooves 15 and introduced into spinning holes 18 which are opened to the two adjacent grooves as seen in FIG. 1-b and then extruded therefrom and spun. The spinning holes 18 are bored in the nozzle plate 6 and under the middle part 19 between two adjacent grooves 15 formed on the back surface of the distribution plate 5, and further are arranged to form a square configuration having the pitch same with the distance between two adjacent grooves. Thus, excellent composite fibers can be obtained from the liquids A and B.

Due to the above-mentioned square configuration of spinning holes 18, if the distribution plate 5 is rotated by 90°, the abovementioned spinneret can be converted to the one suitable for spinning ordinary fibers.

FIG. 2 illustrates an embodiment of the present spinneret wherein the spinneret is set to spin ordinary fibers in a manner as mentioned above. Fiber-forming liquids A and A' are always isolated in all the parts from reservoirs for fiber-forming liquids, filters, chambers for distributing fiber-forming liquids till straight, distributing grooves, and hence ordinary fibers are obtained by separate extrusions of liquids A and A'.

In the spinneret of the present invention, since the pro-

ductions of both composite and ordinary fibers can be attained by rotating by 90° and setting the distribution plate 5 as mentioned above, it is necessary to make the rotation and setting easily. For this purpose, for example, perforated distribution plate 5 and nozzle plate are set by means of set pins, and filters 3 and 3', filter-reinforcing plate 4, perforated distribution plate 5 and nozzle plate 6 are set in covering plate 1 and columnar body 2, by means of bolts 17.

In the spinneret of the present invention, both composite and ordinary fibers can be extruded and spun easily and securely by means of the same spinning apparatus and the same spinneret, and further two kinds of ordinary fibers can be simultaneously extruded and spun, whereby an effective utilization of equipment and a sharp cutting down of equipment cost become possible.

Further, due to great number of spinning holes and setting of filters for fiber-forming liquids in the spinneret, productivity is made higher, spinning holes are protected in better condition, and products of good quality are obtained. Thus, the spinneret of the present invention has great, industrial advantages.

What is claimed is:

1. A spinneret useful for both composite and ordinary fibers comprising right and left reservoirs for two kinds of fiber-forming liquid and right and left filters therefor; a filter-reinforcing plate, placed just under the filter, which has holes divided into right and left groups, to introduce fiber-forming liquids after passing through the filters into right and left chambers for distributing fiber-forming liquids which are formed as hollow spaces on the back surface of the filter-reinforcing plate; a perforated distribution plate, placed just under said filter-reinforcing plate, which has holes for distributing fiber-forming liquids from said right and left chambers into straight, distributing grooves formed on the back surface of the perforated distribution plate and arranged at equal intervals, in parallel and in the direction perpendicular to the boundary between the right and left groups, the fiber-forming liquid from the right and left chambers being alternately distributed into subsequent grooves; and a nozzle plate placed just under said perforated distribution plate and having spinning holes positioned under the middle part of each two adjacent grooves and opened to each of said adjacent grooves to receive fiber-forming liquids from both of said two adjacent grooves, and further arranged so that each of the spinning holes form a square configuration having the pitch same with the distance between two adjacent grooves, whereby the two kinds of fiber-forming liquid extruded from these holes can form composite fibers and if said perforated distribution plate is rotated by 90°, they can form ordinary fibers.

References Cited

UNITED STATES PATENTS

3,237,245	3/1966	Nonami et al.	18—8
3,375,548	4/1968	Kido et al.	18—8

TRAVIS S. McGEHEE, Primary Examiner