

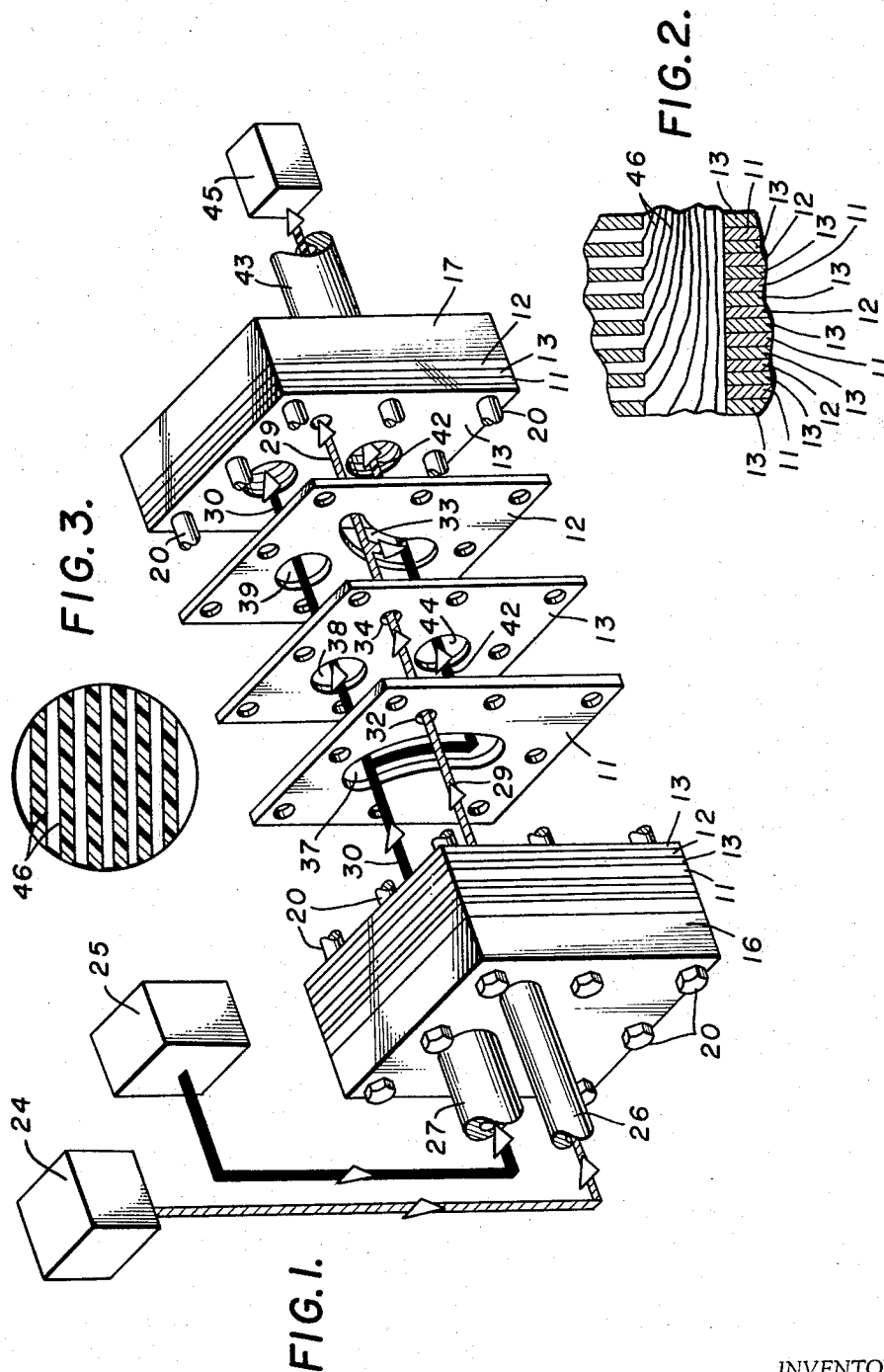
Jan. 3, 1967

F. B. POWELL ET AL

3,295,552

APPARATUS FOR COMBINING SPINNING COMPOSITIONS

Filed Jan. 14, 1965



INVENTORS
FRED BOUCH POWELL
BRIAN KENT POLK

BY *Robert L. Broad Jr.*
ATTORNEY

1

3,295,552

APPARATUS FOR COMBINING SPINNING
COMPOSITIONSFred B. Powell, Decatur, Ala., and Brian K. Polk, Tus-
cola, Ill., assignors to Monsanto Company, St. Louis,
Mo., a corporation of Delaware

Filed Jan. 14, 1965, Ser. No. 425,513

4 Claims. (Cl. 137-604)

This is a continuation-in-part of application Serial No. 204,707, filed June 25, 1962, in the names of Fred B. Powell and Brian K. Polk, now abandoned.

This invention relates to fluid combining methods and devices and more particularly to methods and devices for mixing two spinning compositions to form composite filaments.

In order to produce a crimp or curl in a thermoplastic chemical filament numerous processes and machines have been developed. These processes and machines can be substantially eliminated by producing a conjugate or composite filament of two different spinning solutions and then subjecting the filament to a heat treatment. The different shrinkage characteristics of the two solutions of compositions cause the heat treated filament to curl. One of the disadvantages of this arrangement is that most conjugate spinnerettes do not, because of complexity of construction, have a great number of spinning orifices. This, of course, limits production. It has been found that a bundle of filaments containing a percentage of composite filaments will crimp or curl when annealed. With this in mind, one of the objects of this invention is to provide novel and improved methods and apparatus for combining spinning compositions to provide composite filaments.

Another object of this invention is to provide a device for mixing two fluids.

A further object of this invention is to provide methods and apparatus for combining or merging two spinning compositions in such a manner that composite filaments are formed when the combined compositions are forced through a conventional spinnerette.

Still another object of this invention is to provide a fluid mixer which is made up of a plurality of laminations.

Yet another object of this invention is to provide a fluid mixer having an outlet passageway into which two spinning compositions are introduced at alternating points.

Still another object of this invention is to provide methods and apparatus for combining a plurality of spinning compositions in such a manner that the compositions flow in longitudinal layers.

One embodiment of the present invention contemplates a fluid mixer made up of a plurality of laminations positioned in stacked relationship. The laminations are provided with aligned apertures which define an outlet port and a pair of inlet ports, the three ports being spaced apart and parallel to each other. Alternate laminations are provided with slots leading from the inlet ports to the outlet port so that two spinning compositions introduced into the inlet port flow through the slots into the outlet port. The construction of the device is such that the two compositions enter the outlet port at spaced points, each composition entering the outlet port at alternate points.

In a process illustrating one embodiment of the invention, a plurality of spinning compositions are fed into a conduit in such a manner that the compositions flow along the conduit in longitudinal layers to a conventional spinnerette, adjacent layers being of different composition. Because of the high viscosities and low flow rates of the compositions, the lines of demarcation between adjacent layers are fairly well defined. Where one of these lines of demarcation intersects an orifice in the conventional spinnerette a conjugate or composite filament is formed.

2

Since the layers are fairly thin, there will be a large number of these lines of demarcation and, consequently, a large number of composite filaments.

Other objects and advantages of the invention will become apparent when the following detailed description is read in conjunction with the appended drawing, in which

FIGURE 1 is a partially exploded perspective view of the device showing the structure of the laminations,

FIGURE 2 is an enlarged, fragmentary cross section taken along the outlet port showing the manner in which the two spinning compositions are formed into layers, and

FIGURE 3 is an enlarged cross sectional view of the compositions in the line leading to the spinnerette.

Referring now in detail to the drawing, a plurality of first laminations or plates 11 are shown stacked in alternating relationship with second laminations or plates 12, spacing laminations or plates 13 being positioned between adjacent laminations 11 and 12. The laminations 11, 12 and 13 are sandwiched between end plates 16 and 17 and held in this relationship by bolts 20.

Two spinning compositions are fed from sources 24 and 25 through lines 26 and 27 so that the two compositions flow through the device along inlet paths 29 and 30, respectively. The path 29 is defined by an inlet manifold formed by apertures 32, 33 and 34 in the laminations 11, 12 and 13, respectively. The apertures 32-34 are aligned so that a first inlet manifold or passageway is formed through the device. The path 30 is defined by an inlet manifold formed by aligned apertures 37, 38 and 39 in the laminations 11, 12 and 13, respectively.

The apertures 33 and 37 are curved and elongated to terminate at their lower ends in an outlet path 42 leading to a line 43 which leads to a spinnerette 45 (shown diagrammatically in FIGURE 1). The path 42 is defined by a passageway formed by the aligned lower ends of the apertures and an aperture 44 in each of the spacing laminations 13.

In operations of the device, two spinning compositions are introduced into the device through the inlet lines 26 and 27 so that these compositions flow along the spaced paths 29 and 30. The first spinning composition, flowing along the path 29, flows along the apertures or slots 33 into the outlet path 42. The second composition, flowing along the inlet path 30, flows along the apertures or slots 37 into the outlet path 42.

Since the slots 33 and 37 are positioned alternately along the outlet path 42, the two compositions are introduced into the path 42 at alternate points. This insures that the two compositions are distributed in layers across the line 43 leading to the spinnerette 45. Because of the high viscosity and low flow rates of the two compositions there is little actual mixing of the compositions. Instead, the mass flowing through the line 42 will be made up of discrete portions of the two compositions, the lines of demarcation 46 between the different portions being fairly clear.

The use of the spacing laminations or plates 13 is important. Without these plates the compositions will not form layers. Instead, the compositions will flow into the outlet path 42 in such a manner that each composition will occupy one side of the outlet opening 42, with a single vertical plane of demarcation extending along the axis of the path 42.

In the process, the two compositions are introduced into the line leading to the spinnerette in such a manner that the compositions are in alternating layers or strata across the line. In other words the layers extend longitudinally along the line, adjacent layers being of different compositions. In FIGURE 3 the hatched layers represent one composition while the other layers are of the other composition. When these stacked layers are fed

3

through a conventional spinnerette, numerous conjugate filaments are formed.

Of course, additional inlet paths may be provided so that more than two compositions may be combined in the device. In the process, the layers may be made up of more than two compositions.

It is to be understood that the embodiment disclosed herein may be altered or amended and that numerous other embodiments can be contemplated without departing from the spirit and scope of the invention.

What is claimed is:

1. An apparatus for combining a plurality of spinning compositions, comprising a first lamination, a second lamination, a spacing lamination positioned between the first and second laminations, and means for holding the laminations together in face-to-face relationship to form a unitary body, said laminations having therein a plurality of apertures defining a pair of inlet passageways and an outlet passageway, said passageways being perpendicular to said laminations, said passageways being parallel to and spaced from each other, said first lamination having therein a slot extending laterally thereacross from one of the inlet passageways to the outlet passageway, said second lamination having therein a slot extending laterally thereacross from the other inlet passageway to the outlet passageway, said slots being curved in such a manner that they are parallel to each other at the point of entry into the outlet passageway.

2. An apparatus for combining a plurality of spinning compositions, comprising a first lamination, a second lamination, a spacing lamination positioned between the first and second laminations, and means for holding the laminations together in face-to-face relationship to form a unitary body, said laminations having therein a plurality of apertures defining a pair of inlet passageways and an outlet passageway, said passageways being perpendicular to said laminations and parallel to and spaced from each other, said first lamination having therein a slot extending laterally thereacross from one of the inlet passageways to the outlet passageway, said second lamination having therein a slot extending laterally thereacross from the other inlet passageway to the outlet passageway, said slots being curved in such a manner that they are parallel to each other at the point of entry into the outlet passageway, said slots being perpendicular to said passageways.

3. An apparatus for combining a plurality of spinning

4

compositions, comprising a plurality of laminations secured together to form a unitary block, said block having therein a pair of spaced inlet passageways extending in a direction normal to said laminations, said block also having therein an outlet passageway spaced from the inlet passageways and extending in a direction normal to said laminations, said block also having therein a first slot extending laterally from one of the inlet passageways to the outlet passageway, said block also having therein a second slot extending laterally from the other inlet passageway to the outlet passageway, said second slot being spaced from the first slot so that said slots intersect the outlet passageway at spaced points along the length of said outlet passageway, said slots being curved in such a manner that they are parallel to each other at the point of entry into the outlet passageway.

4. An apparatus for combining two spinning compositions, comprising a plurality of laminations secured together to form a unitary block, said block having therein a pair of inlet passageways and an outlet passageway, each of said passageways being normal to the laminations and parallel to and laterally spaced from the other passageways, said block also having therein a plurality of spaced first slots extending laterally from one of the inlet passageways, said block also having therein a plurality of spaced second slots extending laterally from the other inlet passageway to the outlet passageway, said first and second slots being interleaved with each other in such a manner that said slots intersect the outlet path at alternating points along the length of said outlet passageways, said slots being curved in such a manner that they are parallel to each other at the point of entry into the outlet passageway.

References Cited by the Examiner

UNITED STATES PATENTS

206,642	7/1878	Sutherland	137—604 X
2,815,532	12/1957	Braunlich	137—604 X
3,064,680	11/1962	Winslow	137—604

ALAN COHAN, *Primary Examiner*.

ISADOR WEIL, *Examiner*.

D. H. LAMBERT, *Assistant Examiner*.