

March 1, 1966

KUNIJIRO NONAMI ET AL.

3,237,245

APPARATUS FOR THE PRODUCTION OF CONJUGATED ARTIFICIAL FILAMENTS

Filed Sept. 27, 1963

3 Sheets-Sheet 1

Fig. 1

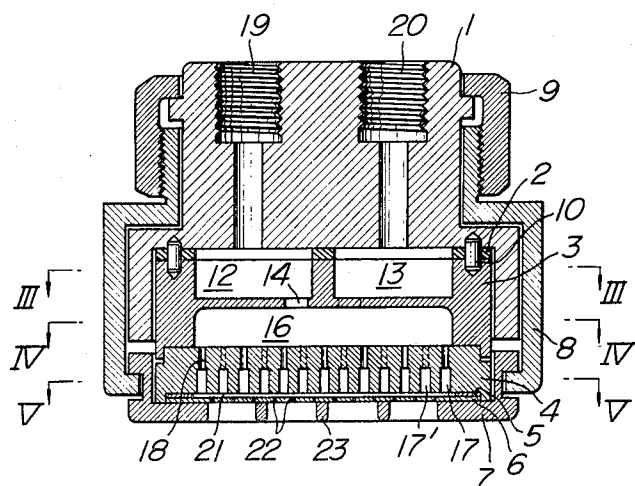
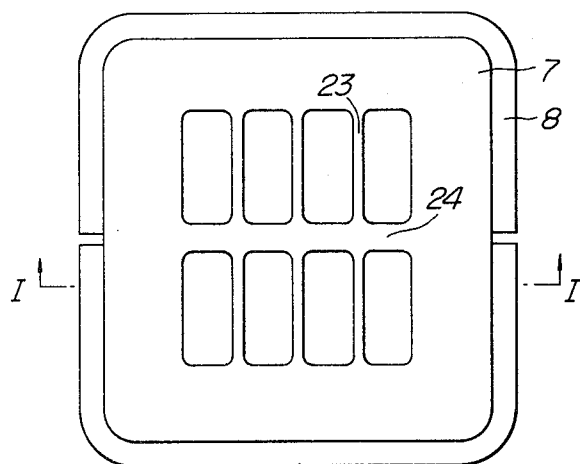


Fig. 2



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Fig. 3

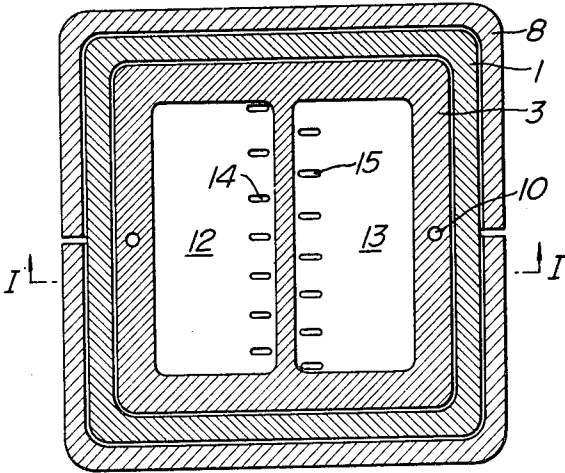
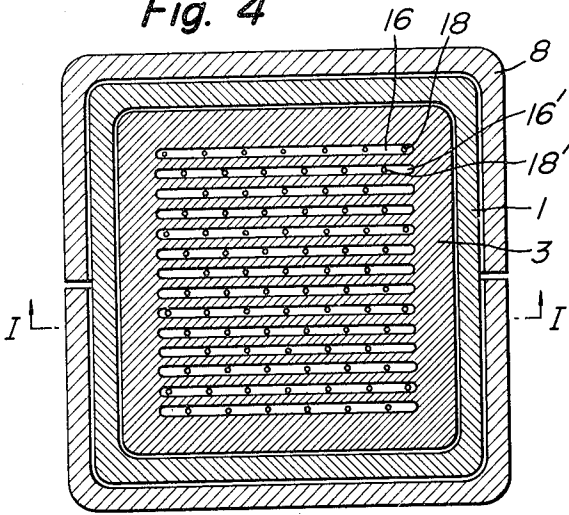


Fig. 4



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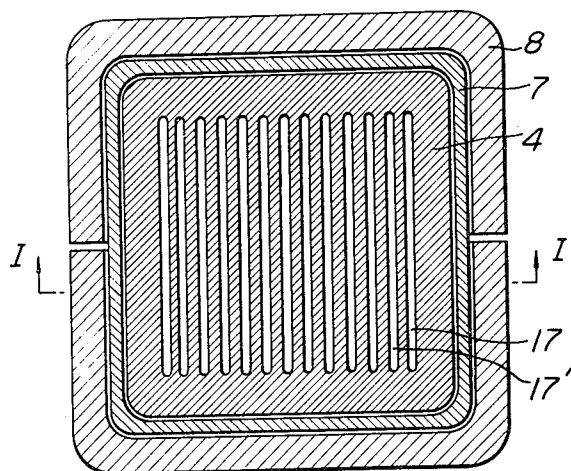
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Fig. 5



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37/44,660, 37/44,661

2 Claims. (Cl. 18—8)

This invention relates to apparatus for the production of conjugated artificial filaments including two or more distinct layers of different basic filament-forming materials and having a noncircular cross-sectional configuration along the entire length of the filaments.

The present invention has for its object to provide an improved apparatus of the kind described which is capable of producing conjugated artificial filaments substantially free from any irregularities in denier as well as in composition or proportion of the different filament-forming materials used.

According to the present invention, different filament-forming materials or spinning solutions are fed into separate feed chambers and flow into a row of transversely extending straight parallel grooves underlying said feed chambers through passages formed in the bottom thereof. The passages are formed in a manner so that the different solutions enter the respective sets of alternate transverse grooves. Below the transverse grooves are arranged a row of longitudinally extending straight parallel grooves formed alternately in communication with said sets of transverse grooves through rows of vertical passages having a limited cross section. Thus, each row of vertical passages is in communication, on the one hand, with one particular set of the transverse grooves and on the other hand with one of the longitudinal grooves to direct therein one particular type of filament-forming material. A spinneret is arranged beneath the row of longitudinal grooves and has a plurality of rows of orifices, which are arranged in vertical alignment with the spaces between the adjacent longitudinal grooves so that the different spinning solutions emerging therefrom are joined together before they enter the spinneret orifices to form conjugated filaments.

A further feature of the present invention is based upon the finding that the spinneret used must have an increased area and orifices arranged in reduced pitches in order to enhance the productivity of the apparatus. However, a spinneret having an increased area generally tends to deflect under pressure of the spinning solutions forming streams of the spinning material differing in state between the central and peripheral regions of the spinneret, and the resulting conjugated filaments will be nonuniform in composition or proportion of the component spinning materials. The problem of the deflection of spinnerets is more acute when they have orifices arranged in smaller pitches as this generally necessitates an increased thickness of the spinneret plate for technical reasons in forming such orifices therein. To avoid these difficulties, the present invention employs a spinneret supporting frame member formed with a central opening and webs extending crosswise thereof in abutting relation with the underside of the solid area of the spinneret to firmly support the latter in place.

The present invention will now be described in more detail with reference to the accompanying drawings, which illustrate one preferred embodiment of the invention and in which:

FIG. 1 is a vertical cross-sectional view of the embodiment taken along the lines I—I in FIGS. 2 to 5;

FIG. 2 is a bottom view of the apparatus;

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FIG. 3 is a horizontal cross-sectional view of same taken along the line III—III in FIG. 1;

FIG. 4 is a view similar to FIG. 3, taken along the line IV—IV in FIG. 1; and

FIG. 5 is a view similar to FIGS. 3 and 4 taken along line V—V in FIG. 1.

Referring to the drawings, the apparatus illustrated includes a holder 1 to be supplied with two different spinning solutions and a first distributing member 3 secured to the underside of holder 1 with a gasket 2 interposed therebetween. Disposed closely beneath said first distributing member is a second distributing member 4, to the underside of which a spinneret 6 is secured by way of a gasket 5 interposed therebetween. The spinneret 6 is supported in place by means of a frame member 7, which is held in place by a retainer 8, which in turn is secured to the holder 1 by means of a nut member 9. The entire assembly is thus firmly held together by tightening the nut 9 on the holder 1. Pins 10 are arranged to fix the position of the first distributing member 3 relative to the holder 1.

The first distributing member 3 has formed therein feed chambers 12, 13, two in number in this embodiment, separated from each other by a longitudinally extending vertical web to be supplied with respective spinning solutions and a row of transversely extending straight parallel grooves 16, 16' slotted beneath said feed chambers in spaced relation to each other. The row of transverse grooves includes two intermeshing sets of such grooves 16, 16' each communicating with one of the feed chambers through passages 14 or 15, which are formed in the bottom of the chambers. The second distributing member 4 has formed therein a row of longitudinally extending straight parallel grooves 17, 17' slotted in the underside thereof in spaced relation to each other and rows of vertical passages 18, 18' having a limited cross section and communicating the longitudinal grooves 17, 17' alternately with the two sets of transverse grooves 16 and 16'. The gasket 5 serves to prevent leakage of the spinning solutions through between the spinneret 6 and second distributing member 4 while giving a desired space 21 therebetween. The orifices 22 in the spinneret 6 are arranged therein so as to vertically align with the spaces between the adjacent longitudinal grooves 17 and 17' or partitions therebetween. The frame member 7 has a central opening and webs 23, 24 extending crosswise thereof and closely beneath the solid area of the spinneret plate 6 to firmly support the latter in place against deflection under the extrusion pressure of the spinning solution.

In the operation of the present apparatus, two different filament-forming materials are supplied by way of separate conduits 19 and 20 to the respective feed chambers 12 and 13 and thence through passages 14 and 15 into the two respective sets of transversely extending grooves 16 and 16' formed beneath the chambers.

The flows of the two different solutions passing through the respective sets of alternate transversely extending grooves 16 and 16' enter the respective sets of alternate longitudinally extending grooves 17 and 17' by way of rows of vertical passages 18, 18', arranged closely beneath the transverse grooves 16, 16', and, leaving the longitudinal grooves 17, 17', are joined together directly in front of the orifices 22 in the spacing 21 for space 6 and extruded therethrough to form conjugated filaments.

As described above, the present apparatus includes a first distributing member 3 having transversely extending straight parallel grooves 16, 16' slotted therein and a second distributing member 4 underlying the first one and having straight parallel grooves 17 and 17' extending longitudinally at right angles to the transverse grooves in the first distributing member 3 so that both

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the two spinning solutions are forced to flow in a pattern of streams uniformly distributed over the entire cross section of the apparatus in front of the spinneret, ensuring that the filaments extruded therethrough are uniform in proportion of the different types of filament-forming material. In addition, the provision of vertical passages 18, 18' having a limited cross section and interconnecting the transverse and longitudinal grooves 16, 16' and 17, 17', further ensures the uniform distribution of the flow of the spinning solutions over the entire cross-sectional area of the apparatus, enhancing the uniformity in denier of the formed filaments, by virtue of the fact that the flow resistance of the fluid passageways in the first and second distributing members 3 and 4 other than the passages 18, 18' is negligible compared with the flow resistance of the passages 18, 18'.

Also, it will readily be appreciated that the use of spinneret supporting frame member 7 in the present apparatus permits the spinneret 6 to have an increased surface area without any danger of the spinneret being deflected under pressure of the spinning solutions or the streams through the spinneret orifices varying in state with their distance from the axis of the spinneret. Accordingly, it will be understood that the filaments produced with this apparatus are uniform in proportion of the different types of filament-forming material, and that the productivity of the apparatus as well as the quality of filaments produced thereon is highly improved.

What is claimed is:

1. An apparatus for the production of conjugated artificial filaments comprising: a first distributing member having at least two feed chambers separated from each other by a longitudinally vertical web, a plurality of transversely extending straight parallel grooves formed in spaced relation to each other, and passages formed

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in the bottom of said respective feed chambers to communicate the latter alternately with said transverse grooves; a second distributing member having a plurality of longitudinally extending straight parallel grooves formed in spaced relation to each other and rows of passages communicating with said respective longitudinal grooves, means retaining said second distributing member being arranged closely beneath said first distributing member so that said rows of passages are alternately in communication with said transverse grooves in said first distributing member; a spinneret having formed therein a plurality of spaced filament-forming orifices; and means supporting the spinneret beneath said second distributing member in slightly spaced relation thereto with said orifices being vertically aligned with the spaces between the adjacent longitudinal grooves.

2. An apparatus as claimed in claim 1 wherein the flow resistance between the said chambers and the spinneret is greatest in the rows of passages in the second member to insure uniform distribution to the spinneret to provide uniformity in denier of the filaments, and the spinneret supporting means includes a central opening and webs extending crosswise thereof in abutting relation to the spinneret.

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