July 14, 1959 R. H. BRAUNLICH 2,894,802

METHOD OF FORMING CRIMPED ARTIFICIAL FILAMENTS

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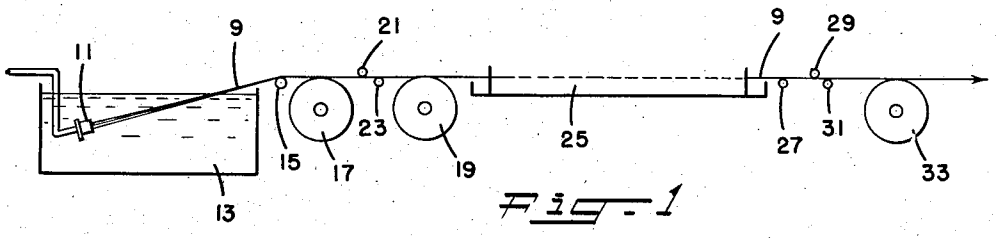

Fig. 1

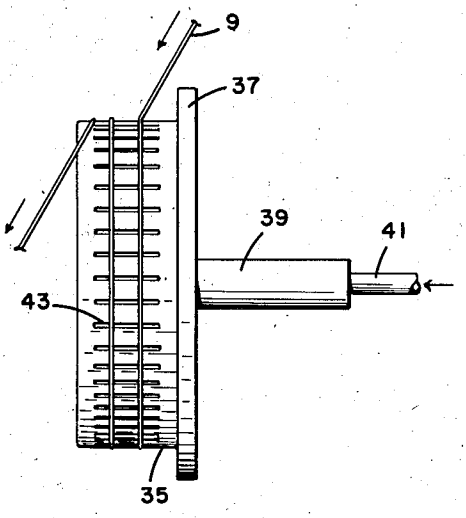

Fig. 2

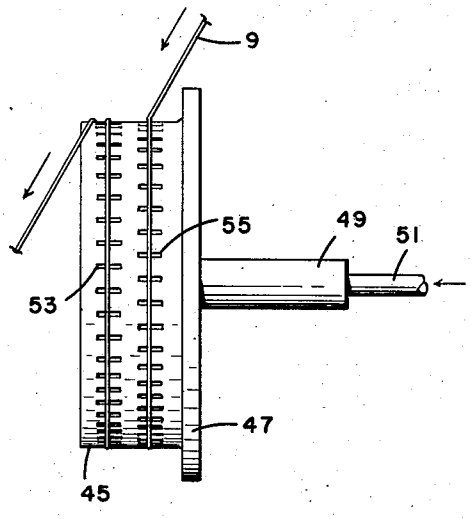

Fig. 3

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METHOD OF FORMING CRIMPED ARTIFICIAL FILAMENTS

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8 Claims. (Cl. 18—54)

The invention relates to the manufacture of artificial filaments, and particularly to the production of crimped artificial filaments.

In forming artificial filaments, as for example from viscose material, various methods have been utilized to impart a desired crimp to the finished yarns. Some of these prior methods have relied upon mechanical deformation of the filaments, as for example by passing the same between a pair of meshing gears, while other known methods rely upon a pile up of filaments in the regenerating bath, as shown for example in Figure 4 of the United States Patent 2,625,461 to Richter, Jr., et al. In accordance with the present invention, a marked departure is made from the conventional crimping methods by inducing strains in the cellulose structure of the filaments as they emerge from the coagulating acid bath thereby causing the filaments to crimp. During the coagulating stage, little or no regeneration of the filaments takes place and thus the filaments emerge therefrom with a large percentage (50% or more) of the cellulose in the tow remaining in the form of cellulose xanthate. The tow at this stage will maintain a xanthate form for a considerable length of time when kept in a wet condition, and it is during this time that it is subjected to an uneven application of heat which produces uneven regeneration and a resulting crimped finished yarn.

It is a primary object of the present invention to provide a generally new or improved and more satisfactory method for producing crimped yarn.

Another object is the provision of a method of inducing strains into a tow of partially formed filaments to impart a crimping thereof.

Still another object is to provide a method of crimping a tow of filaments by the uneven regeneration thereof.

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

Figure 1 is a diagrammatic side view of apparatus suitable for practicing the present invention and serves to illustrate various stages through which the tow passes during its production;

Figure 2 is a front view of one form of godet for applying heated fluid to the tow of filaments; and

Figure 3 is a view similar to Figure 2 illustrating a modified godet.

In general, the invention is directed to the crimping of filaments by heating a tow of partially formed filaments at spaced locations along its length as it emerges from the coagulating bath. Upon leaving the coagulating bath, the greater portion of the cellulose in the tow is in the xanthate form, thus the heated areas of the tow are regenerated more rapidly than the remaining portions thereby inducing strains into the tow which produce the resulting crimp in the finished yarn. The uneven heat application to the tow is preferably accomplished by passing the tow spirally about a godet having a plurality of closely spaced radially extending heated fins, or a godet having a slotted peripheral wall through which steam or

other heated fluid can flow and contact the adjacent tow areas. Preferably, but not necessarily, the method of the present invention can be incorporated into the "two step spinning" process described in the United States Patent 2,625,461 to Richter, Jr., et al.

With reference to Figure 1 of the drawing, and as more specifically described in the above-noted patent to Richter, Jr., et al., the tow of artificial filaments 9 is formed by spinning a viscose material through the spinneret 11 and into the coagulating bath 13 which comprises, for example, an aqueous solution of sodium sulfate and an acid sodium phosphate, and which may also include a phosphoric acid. The bundle or tow of cellulose xanthate filaments thus formed are passed over a guide 15 and over the godets 17 and 19, between which are provided a pair of staggered guides 21 and 23 for stripping the excess coagulating bath from the tow. In passing from the godets 17 and 19, the filaments are stretched to the desired extent as more particularly described in the above-noted patent. Upon leaving the godet 19, the tow of filaments pass into the regenerating bath 25, which at the start of operation comprises, for example, an aqueous solution of sulphuric acid, phosphoric acid, and sodium sulfate. From the regenerating bath the tow 9 passes over a guide 27 and between the guides 29 and 31 which remove the excess regenerating bath before the tow is received by the godet 33. After passing over the godet 33, the filaments may then be disulfided, bleached, washed, treated with a finish, dried, and collected in a continuous and conventional manner.

When leaving the coagulating bath, approximately 50% or more of the cellulose in the tow remains in the xanthate form and maintains this form for a considerable period of time when kept in a wet condition. In accordance with the present invention, the method described in the above-cited patent is modified by producing an uneven regeneration of the cellulose in the tow as it emerges from the coagulating bath, thus setting up strains in the cellulose structure and providing a crimping of the finished yarn. Uneven regeneration is produced, preferably, by heating spaced areas along the length of the tow to a temperature preferably in the range of 50° C. to 120° C. and thus the godet 17 may be provided with radial fins capable of being heated or with slots for discharging heated fluid onto the tow as it passes thereof. A heated finned godet having a construction as shown for example in the United States Patent 2,620,258 to McLellan or a slotted godet as shown in Figures 2 and 3 is considered to be satisfactory.

As shown in Figure 2, the godet is of hollow construction and includes a cylindrical wall 35 secured at one end to the end wall 37, which is of greater diameter than the wall 35, and is closed at its opposite end with a suitable structure not shown. A tubular shaft 39 is rigidly secured at one end to the wall 37 and is adapted to be rotated in the conventional manner for turning the godet about its axis. Extending into the shaft 39 is an inlet conduit 41 through which hot fluids, such as air, steam, or a regenerating acid, is conveyed into the hollow interior of the godet. The fluid received in the godet is discharged therefrom and onto the tow at spaced points along its length through the elongated slots 43 which are disposed longitudinally of the cylindrical wall 35 and approximately parallel to the godet axis. From the godet structure described, it is evident that the hot fluids will cause the selected spaced areas of the tow to be regenerated more rapidly than the remaining area thereby setting up strains in the cellulose structures which provide the desired crimp in the filaments themselves.

The modified godet shown in Figure 3 is generally similar to that shown in Figure 2 and includes a cylindrical wall 45 connected to an end wall 47 which is similar

to the wall 37 heretofore described. A shaft 49, fixed to the wall 47, imparts a rotary movement to the godet. As in the structure shown in Figure 2, a conduit 51 supplies heated fluid to the hollow interior of the godet from which it is discharged through the longitudinally spaced series of peripheral slots 53 and 55. The slots 53 and 55 extend longitudinally of the cylindrical wall 45 and are substantially parallel to the godet axis. However, in this construction, it will be noted that the peripheral slots 53 are in staggered relationship relative to the slots 55 in the adjacent series. In this manner, the areas of the tow 9 subjected to the heating fluid passing through the slots 53 will lie intermediate those areas heated by the fluid passing through the slots 55.

It will be of course understood that the godet constructions shown in Figures 2 and 3 are merely given by way of example, and that the fluid discharging slots may be disposed at a diagonal or in any other suitable position if desired.

After passing over the godet 17, the unevenly regenerated cellulose tow is passed over the godet 19 and then undergoes the usual and known production stages as described above in relationship to the method set forth in the Richter, Jr., et al. patent. The method of crimping artificial filaments as described above can be carried out with only a slight modification of the Richter, Jr., et al. method, and does not necessitate the installation of any complex and expensive equipment. Furthermore, the crimping of the filaments by setting up strains in the cellulose structure permits any desired crimping pattern to be applied which was not heretofore possible with the method shown in Figure 4 of the Richter, Jr., et al. patent, and eliminates any risk of damaging the filaments as is possible when the filaments are crimped by passing the same through a pair of meshing gears.

It is seen from the above description that the objects of the invention are well fulfilled by the method and apparatus 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. The method of forming crimped artificial filaments including the steps of extruding a viscose solution into a coagulating bath to form a continuous tow of filaments,

and regenerating the coagulated tow of filaments at longitudinally spaced intervals therealong to induce strains and a resulting crimping thereof.

2. The method of forming artificial filaments including the steps of extruding a viscose solution into a coagulating bath to form a tow of filaments, and rapidly regenerating spaced areas of the tow along its length immediately after it is withdrawn from the coagulating bath to induce strains and a resulting crimping thereof.

3. The method of forming crimped artificial filaments including the steps of extruding a viscose solution into an aqueous coagulating bath to form a tow of filaments, heating spaced areas along the tow length to produce uneven regeneration, and passing the tow through an aqueous regenerating bath to complete regeneration thereof.

4. A method as defined in claim 3 wherein heating of said tow is effected by hot fluid.

5. A method as defined in claim 4 wherein said fluid is a cellulose regenerating acid.

6. A method as described in claim 3 wherein heating of said tow is effected to a temperature ranging from 50° C. to 120° C.

7. A method of forming crimped artificial filaments including the steps of extruding a viscose solution into a coagulating bath to form a tow of filaments, straining the cellulose structure of the coagulated tow of filaments at spaced points along the tow length, and subsequently passing said tow of filaments through a regenerating bath.

8. A method of forming crimped artificial filaments including the steps of regenerating a tow of viscose filaments in the cellulose xanthate form to a degree varying intermittently along its length, and passing the tow of filaments through an aqueous bath to complete the regeneration thereof.

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