

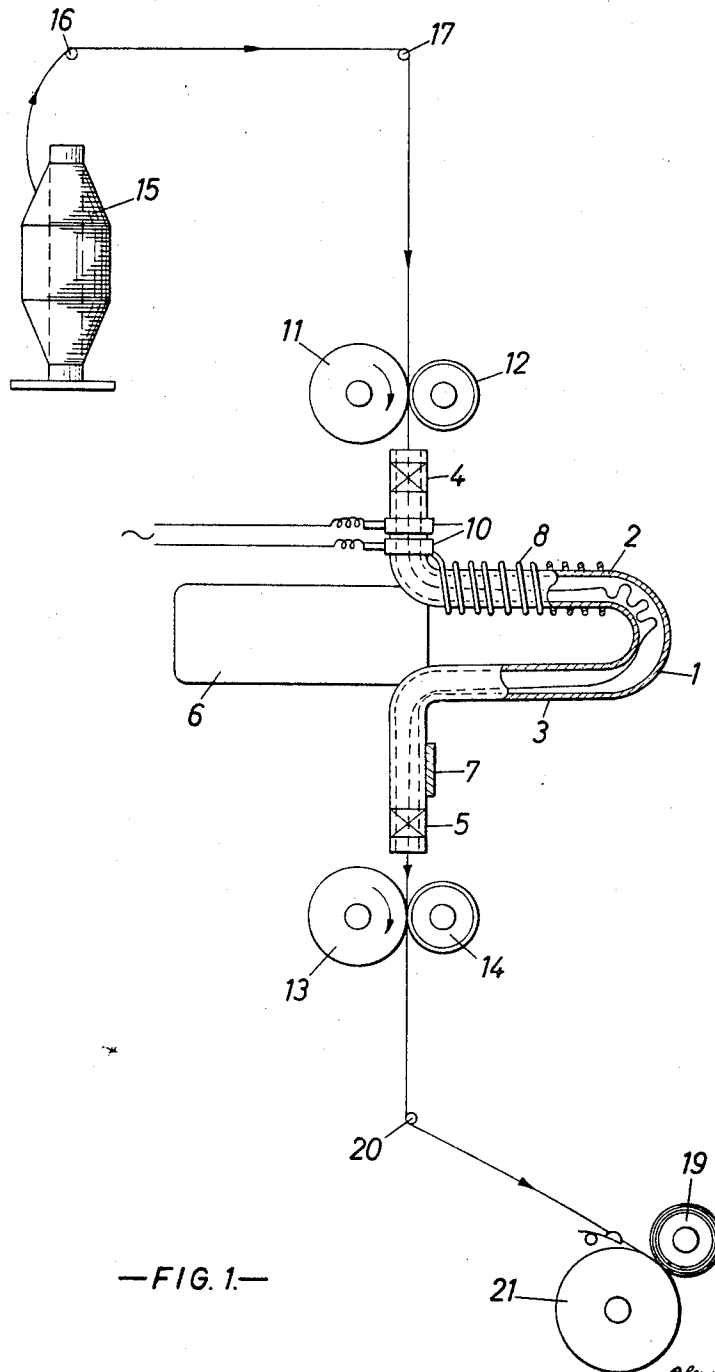
Sept. 17, 1968

F. SCRAGG ET AL
METHOD OF CENTRIFUGALLY CRIMPING THERMOPLASTIC
TEXTILE FILAMENTS

3,402,238

Filed Oct. 7, 1963

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—FIG. 1.—

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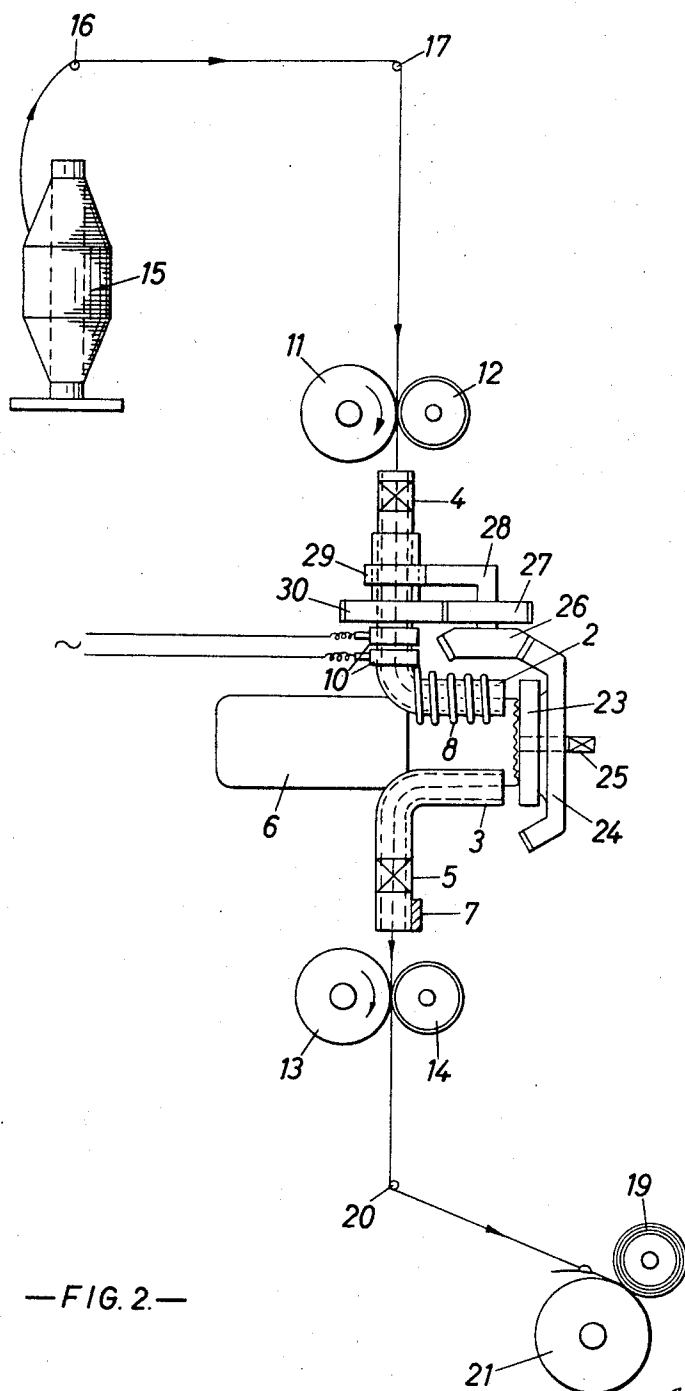
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—FIG. 2.—

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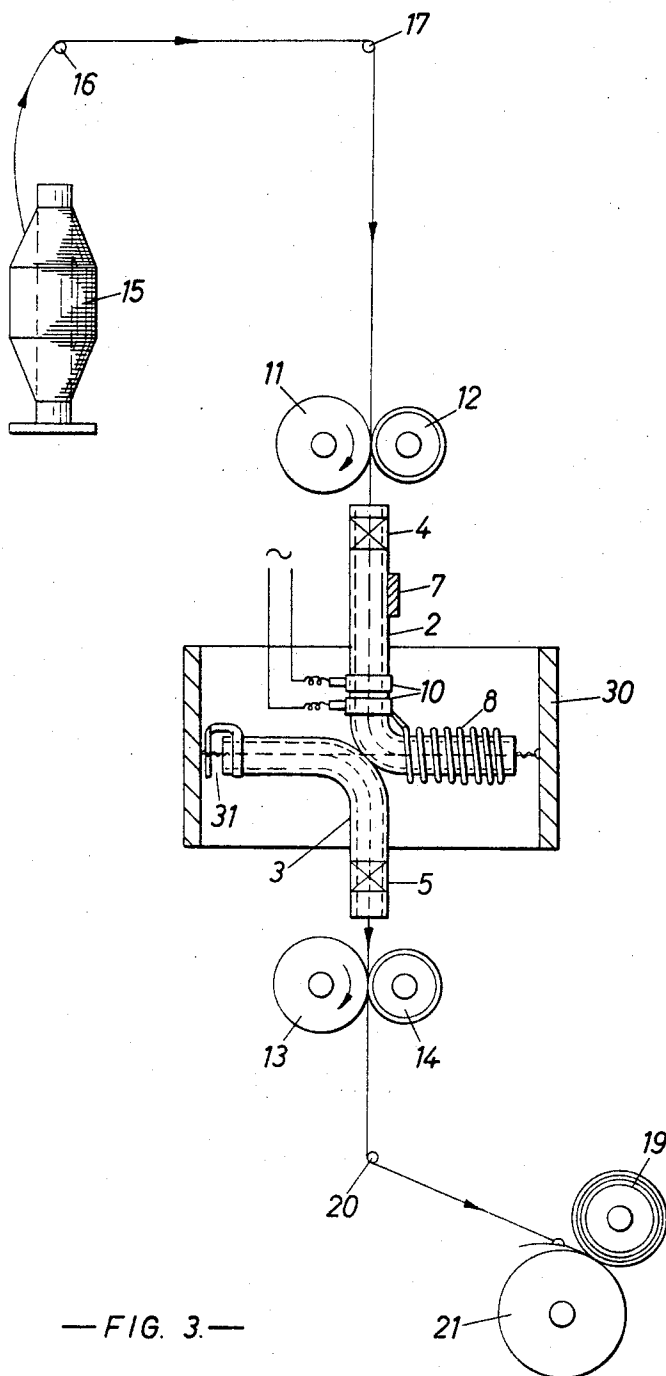
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Filed Oct. 7, 1963

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— FIG. 3. —

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3,402,238

METHOD OF CENTRIFUGALLY CRIMPING THERMOPLASTIC TEXTILE FILAMENTS

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Filed Oct. 7, 1963, Ser. No. 314,351

Claims priority, application Great Britain, Oct. 5, 1962, 37,710/62

11 Claims. (Cl. 264—282)

This invention comprises improvements in or relating to methods of processing thermoplastic textile filaments.

According to the invention, there is provided a method of processing thermoplastic textile filaments, comprising the steps of heating the filaments, crimping the filaments by urging the heated filaments lengthwise against a surface by revolving a length of the filaments about one end of said length, and cooling the filaments.

Preferably, said filaments are continuous and are continuously treated, the revolving of said length of the filaments continuously feeding the filaments to said surface.

In one arrangement crimped filaments may be removed from the said surface by pressure upon them of succeeding parts of said filaments. In another arrangement, said surface moves relatively to the point toward which said filaments are urged, to carry the crimped filaments away from said point.

Revolving a length of the heated filaments may be accomplished by passing the filament through a tube including two mutually inclined portions and revolving the latter about one of these portions to urge said length of filaments to move through the tube and out of the other end which is spaced from the end about which the tube revolves.

Such a tube may have two mutually angled branches and be adapted to rotate about the axis of one of said branches, and it may also be adapted to receive filaments through said one branch to permit the passage of filaments from the other branch by rotating to urge a length of filaments in said other branch outwardly with respect to said axis. The two branches are preferably perpendicular to one another.

The filaments may be heated while in said other branch, and the means for heating may be an electrical heating element disposed about said other branch and being fed with electric current through a slip ring or like arrangement.

Said surface may be adapted to rotate about said axis with the same angular velocity as said tube, or may be adapted to rotate about said axis with a small angular velocity relative to said tube.

A means may be provided which is adapted to remove filaments from said surface. Said means may comprise a second tube adapted to revolve about one end, and to receive at the other end crimped filaments from said surface and to permit the passage of said filaments through said one end. Said means may also comprise a second tube having two mutually angled branches one of which is adapted to be coaxial with, and both of which are adapted to rotate about the axis around which said filaments are revolved, said one branch being adapted to receive crimped filaments from said surface and the other branch being adapted to pass said crimped filaments received by said one branch.

Methods of processing thermoplastic textile filaments according to the invention will now be described with reference to the accompanying drawings in which

FIGURE 1 is a part sectional elevation of one embodiment of an apparatus which is suitable for carrying out the inventive methods,

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FIGURE 2 is a sectional elevation of another embodiment, and

FIGURE 3 is a sectional elevation of another embodiment.

In FIG. 1, a U-shaped tube 1, having two branches 2, 3, is mounted for rotation about bearings 4, 5. The tube is provided with a counter-balance 6 and is driven by a belt 7. The branch 2 is provided with a heating winding 8 which is preferably surrounded by a layer of insulating material, and the winding is energised by an electrical supply via slip rings 10.

In addition to the rotating tube the embodiment of FIG. 1 also comprises a driven roller 11, and a nip roller 12, the latter being mounted in such a way as to be pressed against the driven roller 11. The roller 12 is provided with a covering of resilient material. A further driven roller 13 and nip roller 14 are also provided, these being for the purpose of withdrawing the yarn from the tube.

The arrangement shown acts on yarn derived from a supply package 15, the yarn being led via guides 16, 17, to the input forwarding rollers 11, 12. Thereafter the yarn enters branch 2 of the tube where it is heated and becomes subject to centrifugal force since the tube is rapidly rotated by belt 7. When the yarn reaches the right-hand end of the U tube it encounters the end surface of the inside of the tube and is compressed by the said centrifugal force, thus forming kinks in the yarn. Thereafter the yarn is pulled by the rollers 13, 14, round the end of the U tube and into the cold branch 3, and thereafter passes via guide 20 to a wind-up package 19 which is driven at constant peripheral speed by a bowl 21.

In FIGURE 2 is shown an arrangement similar to that in FIGURE 1 but having an alternative method of transferring yarn from branch 2 to branch 3. As before yarn is drawn from the package 15 via guides 16, 17, the yarn being forwarded by rollers 11, 12, to a tube branch 2 heated by a winding 8. This time the yarn after passing along the tube 2 in a straight condition under the effect of centrifugal force, and being heated meanwhile, impinges on a circular plate 23 which is cooled, and which is connected to gear wheel 24, the plate and wheel being rotated on a shaft passing through a bearing 25, the latter being carried by part of the framework (not shown) of the apparatus. The gear wheel 24 meshes with another gear 26 which is connected to a spur gear wheel 27, the two wheels 26, 27, being carried on a bent shaft 28. The shaft 28 is provided with bearing 29, and gear wheel 27 meshes with a fixed gear wheel 30. The whole assembly comprising members 28, 27, 26, 24, 23, 3 and 2, together with a counter-weight 6, are rotated as described in connection with FIGURE 1 by belt 7, so that the circular plate 23 rotates relatively slowly across the ends of the branches 2 and 3. Yarn entering branch 2 is heated during passage along this branch, whereafter it emerges therefrom and impinges on the plate 23, forming a small pile of compression crimped yarn. Since circular plate 23 rotates slowly, the pile is drawn out into a circumferential line, until the other end of the line reaches the end of branch 3. Yarn is extracted from circular plate 23 by the rollers 13, 14, along branch 3, whereafter the yarn as before is wound up after passage through the guide 20 on package 19.

A further alternative is shown in FIGURE 3. Here, as previously described, yarn is drawn from a supply package 15, through guides 16, 17, and forwarding rollers 11, 12, to a tube branch 2, having a bearing 4 and driven by a belt 7. The radially extending end of this branch 2 is heated by an electrical winding 8, and yarn passing into the branch 2 and along its radial extension passes from the outer end of the branch against the inner surface of a

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rotating cylinder 30, the rate of rotation of the cylinder being different from that of the branches 2 and 3, which are formed as a unitary structure. The yarn crimps against the inner surface of the cylinder 30 and is cooled thereby. Owing to the difference in rotational speed between the branches and the cylinder 30 a band of crimped yarn forms on the inside of the cylinder and this band shortly reaches the outer end of the branch 3. Here the yarn is removed from the inner surface of the cylinder 30 by a scoop 31 after which it is removed from the scoop by the rollers 13, 14, and after passage round the guide 20 is wound on the package 19 as previously described.

It should be noted that a very complete control is possible of the degree of crimp achieved. Thus a rise in temperature of the heater 8 causes a reduction in modulus of the yarn so that the average length of yarn between crimps is reduced. An increase in rotational speed of the branches 2, 3, has the same effect, so that the average crimp length can be adjusted and controlled to suit the particular kind of yarn being treated, or kind of effect required. It should however be noted that since the yarn is heated and cooled in a continuous process the uniformity of treatment can be of a very high order, and can be made considerably better than in the known method of heating yarn in a crimping chamber or stuffer box.

What we claim is:

1. A method of processing thermoplastic textile filaments, comprising the steps of heating the filaments, crimping the filaments by urging the heated filaments lengthwise against a surface by revolving a length of the filaments about one end of said length, and cooling the filaments.

2. A method according to claim 1, wherein said filaments are continuous and are continuously treated, the revolving of said length of the filaments continuously feeding the filaments to said surface.

3. A method according to claim 2, wherein crimped filaments are removed from said surface under the influence of pressure exerted upon them by succeeding portions of said filaments, and wherein crimped filaments so removed are thereupon advanced in a predetermined direction away from said surface.

4. A method according to claim 2, wherein said surface moves with reference to the point toward which said filaments are urged to thereby carry the crimped filaments away from said point.

5. A method of processing a synthetic thermoplastic

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filament, comprising the steps of increasing the deformability of a length of synthetic thermoplastic filament; and continuous revolving and advancing said length of such filament lengthwise against and into engagement with an abutment surface, so as to crimp said length in response to contact thereof with such abutment surface.

6. A method as defined in claim 5; and further comprising the step of reducing the deformability of the crimped filament.

7. A method as defined in claim 5, wherein the step of revolving and advancing a length of filament comprises revolving a first portion of said length about a second portion thereof in angularly extending relationship therewith.

8. A method as defined in claim 5, wherein the step of revolving and advancing a length of filament comprises subjecting at least a portion of said length to centrifugal force to thereby advance said length against said surface.

9. A method as defined in claim 5; and further comprising the step of displacing such portions of said filaments as engage the surface in a direction transversely of the direction in which the filament advances against the surface.

10. A method as defined in claim 5, wherein the step of increasing the deformability of said filament comprises subjecting the filament to the influence of an elevated temperature.

11. A method as defined in claim 10, wherein the step of reducing the deformability of the crimped filament comprises terminating the influence of such elevated temperature on said filament.

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