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HANDLING OF CONTINUOUS FILAMENTS

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This invention relates to the handling of continuous filaments, and in particular to the use and treatment of continuous filaments in the form of yarns or bundles of associated filaments.

5 The invention is particularly concerned with continuous filaments made of or containing material capable of exhibiting electrostatic action, for example filaments of cellulose acetate or other organic derivatives of cellulose. As produced in the spinning machine, yarns of this character
10 usually have the filaments in closely spaced relationship, either substantially parallel to each other in an untwisted yarn, or in sharp pitched helical formation in the case of a yarn to which
15 the usual small amount of twist has been imparted.

For some purposes this close spacing is disadvantageous, for example where the filaments are to be severed into staple fibre, and again in operations for the direct conversion of the filaments
20 into staple fibre products as described in U. S. applications S. Nos. 155,226, filed 23rd July 1937, and 168,862, filed 14th October 1937, since the ultimate object in staple fibre processes is to produce a yarn in which individual fibres are distributed as uniformly as possible throughout the length of the product. Close adhesion between
25 fibre and fibre at the time of cutting makes difficult the separation of fibre from fibre necessary for the bringing about of the uniform distribution.

According to the present invention, in the handling of continuous filaments in the form of a bundle, the bundle of filaments is drawn over
35 and in sliding contact with a surface of material removed in the electrostatic series from the material of the filaments so as to impart to the filaments a charge of static electricity and to cause them to separate from one another. The invention may conveniently be carried out by
40 means of a roller, surfaced with the appropriate material, and rotated with a peripheral speed different from that of the filaments. Means may be provided to adjust the amount of contact of the filaments with the surface so as to control the extent to which electrification is effected. It is advantageous to traverse the filaments laterally across the electrifying surface so as to maintain the electrifying action substantially constant.
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The thus electrified filaments are fed to the point of use, e. g. a cutter that repeatedly cuts from the separated filaments at the end of the bundle, staple fibres suitable for spinning, or a
55 device of the kind described in the two specifications mentioned above for the direct production of a staple fibre product from continuous filaments. Such forwarding means may, for instance, comprise an air jet through which the electrified filaments are passed, the non-positive action of the air stream serving if anything to augment the separation of the filaments brought about by the electrification. The air stream, moreover, maintains the filaments under sufficient tension to keep them in contact with the electrifying surface. Thus, with a roller rotating in the same direction as the movement of the filaments, the roller neither tends to retard the delivery of the filaments nor, because the frictional contact necessary for electrification is only light, does it tend to overdrive the filaments.

The filaments may be delivered from any suitable kind of package, for example they may be drawn over-end from a flanged bobbin, bottle bobbin, cone or the like by means of feed rollers, or from a bobbin capable of rotating about its axis under the pull exerted by the feed rollers. Again, the package may be mounted on a spindle capable of being positively rotated at a constant speed or at a speed compensating for the diminution in package diameter as unwinding proceeds, the air jet described above being particularly useful in this connection in that it enables the forwarding of the filaments to take place precisely in accordance with the peripheral speed of the package throughout the unwinding operation.

By way of example some forms of apparatus provided with means according to the present invention will now be described in greater detail with reference to the accompanying drawing in which
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Figs. 1 and 2 are a front elevation and a side elevation, partly in section, respectively, of one form of apparatus embodying the present invention; and
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Figs. 3 and 4 are diagrammatic side elevations of two other forms of apparatus embodying the invention.

Referring to Figs. 1 and 2, continuous filaments of cellulose acetate are employed, and are drawn from the package 1 in the form of two bundles of filaments 2. The package 1 is provided with flanges 3 each of which rests on a pair of driving wheels 4, the two pairs of driving wheels being carried on shafts 5 and driven by a shaft 6 by means of gears 7, and a chain 8 engaging sprockets 8' on the shafts 5. By these means the package 1 is rotated at a constant angular speed to permit the bundles of filaments 2 to be with-

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drawn from it. The bundles 2 pass through two guides 9, thence round rollers 10 to a guide tube 11 having within it a nozzle 12 supplied with compressed air through a pipe 13 from a header 14. The blast of air from the nozzle 12 in the guide tube 11 draws the filaments from the package 1 and forwards them to a guide member 15 having a nozzle 16 supplied with air from the header 14 by means of a pipe 17. The guide member 15 has a nozzle 16 of flat and divergent section by means of which the filaments in the bundle 2 are spread in the form of a flat band which is cut at regular intervals as the bundle is delivered by means of a cutter 18 of the hair clipper type operated by an arm 19. The groups of filaments thus severed from the end of the bundle 2 are delivered on a band 20 on which they are held by suction induced by a suction pipe 21, the rate at which the band 20 is driven being such that the bundles of fibres falling thereon overlap, the leading ends of the fibres in each bundle extending beyond the rearward ends of the preceding bundle. The fibres thus deposited on the band 20 are delivered to a pair of bands 22 by means of which they are rubbed into a continuous coherent staple fibre product in the manner described in U. S. application S. No. 155,226, filed 23rd July 1937.

The guide 9 and roller 10 are interposed in the passage of the bundle 2 from the package 1 to the guide tube 11 for the purpose of giving the filaments of the bundle 2 a charge of static electricity. For this purpose the roller 10 is provided with a covering 24 of rubber, gutta percha, or other material appropriately removed in the electrostatic series from cellulose acetate, which is the basic material of the filaments. Furthermore, the roller 10 is driven in the same direction as the filaments but at a greater speed by means of a band 25 and pulleys 26 and 27, the pulley 26 being mounted on the shaft 6 and the pulley 27 on the shaft 28 carrying the roller 10. By these means the covering 24 of the roller 10 is caused to rub against the filaments and by reason of the direction of its rotation and its peripheral speed, does not hinder the nozzle 12 in the guide tube 11 in drawing the filaments from the supply package 1.

In order to adjust the degree of electrification of the filaments the arc of contact between the bundle 2 and the roller 10 may be adjusted by moving the guide 9. For this purpose the guide 9 is formed on the end of a rod 29 passing through small holes in a pair of spring members 30 mounted on a bar 31. The members 30 spring outwards and by reason of the smallness of the holes through which the rod 29 passes, grip the rod firmly. When it is desired, however, to adjust the position of the guide 9 the members 30 may be pinched together, thus releasing the rod and allowing it to be slid in the desired direction. The bar 31 carrying the members 30, rod 29 and guide 9 is slowly traversed endwise so as to change the portion of the surface of the roller 10 with which the bundle 2 is contacting.

By these means the filaments in the bundle 2 receive a charge of static electricity which assists the action of the nozzle 16 in spreading the filaments into a wide flat band.

In Fig. 3 the filaments are drawn as a bundle 33 from a bobbin 34 mounted on a pin 35, the bobbin being stationary and the bundle of filaments 33 being drawn over its end and guided by a guide 36. From the guide 36 the filaments proceed directly to the guide 9 and roller 10, and thence into a pair of draw rollers 37, which serve

to draw the bundle of filaments from the package 34 and to deliver it to the cutting member 18 and band 20 as described with reference to Fig. 1.

Fig. 4 shows a similar modification of the mechanism shown in Figs. 1 and 2 in which, however, a bobbin 39 is rotatably mounted on a spindle 40 and the bobbin 39 is rotated about the spindle 40 by the withdrawal of the bundle of filaments 33 from the bobbin.

Having described my invention, what I desire to secure by Letters Patent is:

1. Apparatus for the handling of continuous filaments in the form of a bundle, said apparatus comprising means for drawing a bundle of filaments from a source of supply and forwarding said filaments, a roller having a surface of material removed in the electrostatic series from the material of the filaments, said drawing means being adapted to draw said filaments in contact over said surface, and means for rotating said roller, so as to change the portion of said surface with which said bundle contacts, but with a peripheral velocity different from the velocity of the filaments in contact with said roller.

2. Apparatus for the handling of continuous filaments in the form of a bundle, said apparatus comprising means for drawing a bundle of filaments from a source of supply and forwarding said filaments, a roller having a surface of material removed in the electrostatic series from the material of the filaments, said drawing means being adapted to draw said filaments in contact over said surface, means for rotating said roller, so as to change the portion of said surface with which said bundle contacts, but with a peripheral velocity different from the velocity of the filaments in contact with said roller, whereby a charge of static electricity is imparted to the filaments which causes them to separate from one another, and means for repeatedly cutting staple fibres from the separated filaments at the end of the bundle.

3. Apparatus for the handling of continuous filaments in the form of a bundle, said apparatus comprising means for drawing a bundle of filaments from a source of supply and forwarding said filaments, a roller having a surface of material removed in the electrostatic series from the material of the filaments, said drawing means being adapted to draw said filaments in contact over said surface, guide means for the filaments adapted to adjust the arc of contact between said filaments and said surface, and means for rotating said roller with a peripheral velocity different from the velocity of the filaments in contact with said roller.

4. Apparatus for the handling of continuous filaments in the form of a bundle, said apparatus comprising means for drawing a bundle of filaments from a source of supply and forwarding said filaments, a roller having a surface of material removed in the electrostatic series from the material of the filaments, said drawing means being adapted to draw said filaments in contact over said surface, guide means for said filaments in the form of a guide eye, a rod carrying said guide eye and a pair of spring members having holes therein through which said rod is adapted to pass, said holes being too small to allow the passage of said rod through both of them when said spring members are in a relaxed condition, and means for rotating said roller with a peripheral velocity different from the velocity of the filaments in contact with said roller.

5. Apparatus for the handling of continuous

filaments in the form of a bundle, said apparatus comprising an air jet for drawing a bundle of filaments from a source of supply and forwarding said filaments, a roller having a surface of material removed in the electrostatic series
5 from the material of the filaments, said air jet being adapted to draw said filaments in contact over said surface, and means for rotating said roller, so as to change the portion of said surface with which said bundle contacts, but with a peripheral velocity different from the velocity of the filaments in contact with said roller.
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6. Apparatus for the handling of continuous filaments in the form of a bundle, said apparatus
15 comprising means for rotating at a definite speed

a package support from which a bundle of filaments is supplied, an air jet for drawing said filaments from said package support and forwarding said filaments at the definite rate permitted by the rate of rotation of said package, a roller having a surface of material removed in the electrostatic series from the material of the filaments, said air jet being adapted to draw said filaments in contact over said surface, and means for rotating said roller, so as to change the portion of said surface with which said bundle contacts, but with a peripheral velocity different from the velocity of the filaments in contact with said roller.
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