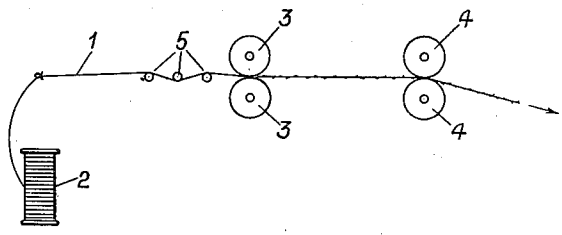
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OPERATION FOR THE PRODUCTION OF STAPLE FIBER YARNS FROM CONTINUOUS FILAMENTS

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OPERATION FOR THE PRODUCTION OF STAPLE FIBER YARNS FROM CONTINUOUS FILAMENTS

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7 Claims. (Cl. 19—1)

This invention relates to operations directed to the manufacture of spun yarns by the conversion of continuous filaments into fibers in such a manner that the continuity of the material is not interrupted.

Such operations may be carried out by passing a plurality of continuous filaments through sets of rollers which grip the filaments, and, by reason of a difference in speed between the rollers, extend them to breaking point, such breaking occurring at different points of different filaments so that there is an overlapping of the fibers produced. Rollers which enable such an operation to be carried out without excessive pressure on the filaments—and consequently less danger of the filaments being damaged or of the whole bundle being cut or unduly weakened—are described in U. S. Patent No. 2,030,252.

A further method, which has the particular advantage that the conversion of the filaments into fibers does not rely on an extension of the filaments to breaking point, is described in U. S. application S. No. 726,264 filed on even date herewith, according to which the filaments are pressed against a cutting surface, e. g. a rotatable cutting roller, between which and the filaments there is slippage so that the filaments are severed by a cutting or shearing action. In this way, the loss of extensibility which accompanies stretching of filaments to their breaking point is largely avoided, with consequent benefit to the elasticity and softness of the final spun yarn.

The continuous conversion of filaments into fibrous material depends for the maintenance of continuity of the fibrous product on the distribution of the points of severance among the whole number of the filaments and at different places along the length of the filaments. Uniformity of the product depends upon the extent to which even distribution can be effected.

Regular severance of the filaments is achieved according to the invention by the provision of means which cause the filament bundle to spread as it comes under the action of the converting device, so that each filament in the bundle is better disposed for treatment.

Thus, the filaments may be electrified so that mutual repulsion brings about their separation, as well as causing a wavy or erratic feed. In the case of filaments of cellulose acetate or other organic derivative of cellulose, for example, such electrification can readily be brought about by passing the filaments over or through one or more rods or guides of wood, steel, glass, or other smooth surfaced material disposed in advance of the converting device so that the friction engenders static electricity in the filaments as they are fed to the device. The electrified filaments separate from each other to an extent controlled by the tension in them and the degree of relative freedom between them. Therefore, it is desirable that the filament bundle should have little or no twist, so that the separated filaments can easily spread apart and pass into the converting device as a more or less flattened band.

Whether or not the filaments are capable of being rendered "lively" by electrification, the spaced disposition of the filaments may also be brought about by the handling of the filaments before they are broken or severed into fibers, e. g. by relying on the mechanical action of the rods or guides. Thus, when the low-twist or untwisted bundle of filaments passes over rods or the like, the tension in the bundle flattens the bundle.

Since the filament bundle passes through the rollers or the like in a generally flattened form, the action of the rollers at any instant falls largely on the portions of the bundle where two or other small number of filaments lie bunched together or cross each other, and, such points changing in position along the length of the bundle, especially when it has a low twist, the rollers operate to sever the filaments into fibers at different points in the bundle. In consequence, although the points of severance do not necessarily fall at equal distances apart along each individual filament, they occur with considerable regularity throughout the bundle, and a high degree of uniformity is obtained in the fibrous material obtained.

A method of carrying out the invention will now be described with reference to the accompanying diagrammatic drawing.

The drawing shows a filamentous bundle 1, for example a low-twist artificial silk yarn, led from a bobbin 2 through pairs of rollers 3, 3 and 4, 4 constructed and operated to break the filaments in the bundle 1 as described in U. S. Patent No. 2,030,252, or to bring about cutting of the filaments as described in U. S. application S. No. 726,264.

Before reaching the first rollers 3, the bundle 1 passes over a number of rods 5 which have the effect, under the tension imposed on the bundle by the pull of the rollers, of flattening the bundle and so distributing its filaments. Moreover, in the case of electrifiable filaments, e. g. filaments of cellulose acetate or other organic derivative of cellulose, the friction between the filaments

and the rods 5 sets up electrification which adds to the separating action of the rods and causes the separated filaments to follow a wavy path into the rollers 3.

Since separation is more easily effected the lower the twist in the bundle 1, a twisted bundle may be unwound from the bobbin 2 in such a direction that the unwinding turns are opposed to the twist in the bundle and so reduce the twist of the bundle before it reaches the rods 5.

After conversion of the continuous filament bundle into a bundle containing staple fibers, the bundle is suitably collected, e. g. by a twisting and winding operation. The initial bundle may be of such size that it can be converted in one operation into a spun yarn, the collecting device (e. g. a cap- or ring-spinning device) inserting an appropriate degree of twist into the yarn.

What we claim and desire to secure by Letters Patent is:—

1. Process for the conversion of continuous filaments directly into a product containing staple fibers, which comprises spreading out a bundle of continuous filaments, causing the spread filaments to pass in contact with a cutting surface moving in substantially the same direction as the filaments but at a peripheral speed different from the speed of the filaments, and pressing the bundle of spread filaments against the surface so that during the movement of the surface the filaments are continuously nipped substantially at a point in the length of the bundle and are subjected at such point to a cutting action that at any one point severs part only of the filaments in the bundle, the movement of the filaments past the cutting surface causing the partial severing action to take place progressively along the length of the filaments.

2. Process for the conversion of continuous filaments directly into a product containing staple fibers, which comprises passing a bundle of continuous filaments over guide means to spread out the filaments, causing the spread filaments to pass in contact with a cutting surface moving in substantially the same direction as the filaments but at a peripheral speed different from the speed of the filaments, and pressing the bundle of spread filaments against the surface so that during the movement of the surface the filaments are continuously nipped substantially at a point in the length of the bundle and are subjected at such point to a cutting action that at any one point severs part only of the filaments in the bundle, the movement of the filaments past the cutting surface causing the partial severing action to take place progressively along the length of the filaments.

3. Process for the conversion of continuous filaments directly into a product containing staple fibers, which comprises passing a bundle of continuous filaments over guide means adapted to set up electrification of the filaments and thereby to cause the filaments to spread out, causing the spread filaments to pass in contact with a cutting surface moving in substantially the same direction as the filaments but at a peripheral speed different from the speed of the filaments, and pressing the bundle of spread filaments against the surface so that during the movement of the surface the filaments are continuously nipped substantially at a point in the length of the bundle and are subjected at such point to a cutting action that at any one point severs part only of the filaments in the bundle, the movement of the filaments past the cutting surface causing the partial severing action to take place progressively along the length of the filaments.

4. Process for the conversion of continuous filaments directly into a product containing staple fibers, which comprises passing a bundle of continuous filaments of cellulose acetate over guide means adapted to set up electrification of the filaments and thereby to cause the filaments to spread out, causing the spread filaments to pass in contact with a cutting surface moving in substantially the same direction as the filaments but at a peripheral speed different from the speed of the filaments, and pressing the bundle of spread filaments against the surface so that during the movement of the surface the filaments are continuously nipped substantially at a point in the length of the bundle and are subjected at such point to a cutting action that at any one point severs part only of the filaments in the bundle, the movement of the filaments past the cutting surface causing the partial severing action to take place progressively along the length of the filaments.

5. Apparatus for the conversion of continuous filaments directly into a continuous product containing staple fibers, comprising a movable cutting surface, means for causing a bundle of continuous filaments to move past the cutting surface in the same general direction as the direction of movement of the cutting surface but at a rate different from the rate of movement of the cutting surface, means for spreading out the bundle of filaments at a point in advance of the cutting surface, and means with which the cutting surface forms a nip to keep the spread filaments continuously pressed against the cutting surface substantially at a point which progresses along the length of the filaments.

6. Apparatus for the conversion of continuous filaments directly into a continuous product containing staple fibers, comprising a movable cutting surface, means for causing a bundle of continuous filaments to move past the cutting surface in the same general direction as the direction of movement of the cutting surface but at a rate different from the rate of movement of the cutting surface, a plurality of rods adapted to engage the continuous filaments and spread them out at a point in advance of the cutting surface, and means with which the cutting surface forms a nip to keep the spread filaments continuously pressed against the cutting surface substantially at a point which progresses along the length of the filaments.

7. Apparatus for the conversion of continuous filaments directly into a continuous product containing staple fibers, comprising a rotatable roller having a cutting surface, means for causing a bundle of continuous filaments to move past the cutting surface in the same general direction as the direction of rotation of the roller but at a speed different from the peripheral speed of the cutting surface, a plurality of rods adapted to engage the continuous filaments and spread them out at a point in advance of the roller, and a further rotatable roller forming a nip with the cutting surface of the first-mentioned roller and adapted to keep the spread filaments continuously pressed against the cutting surface substantially at a point which progresses along the length of the filaments.

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