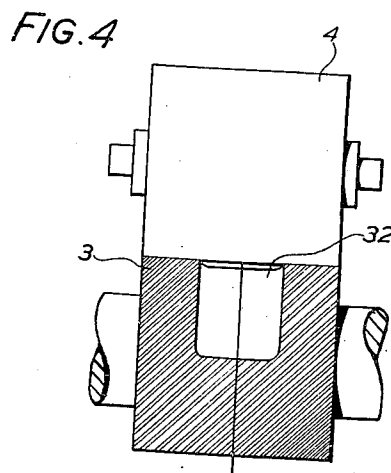
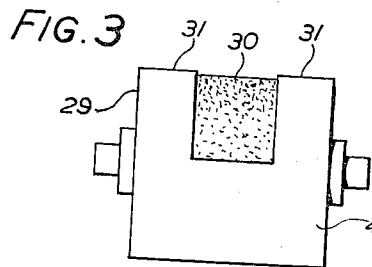
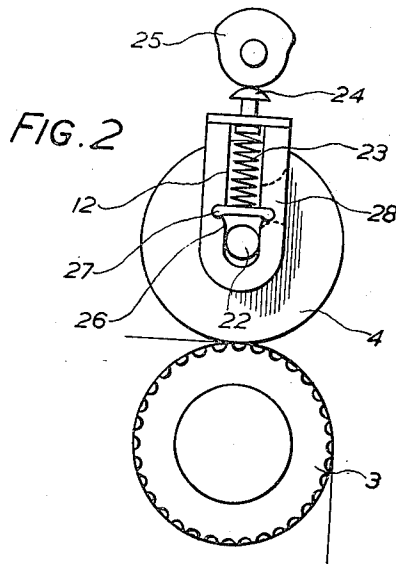
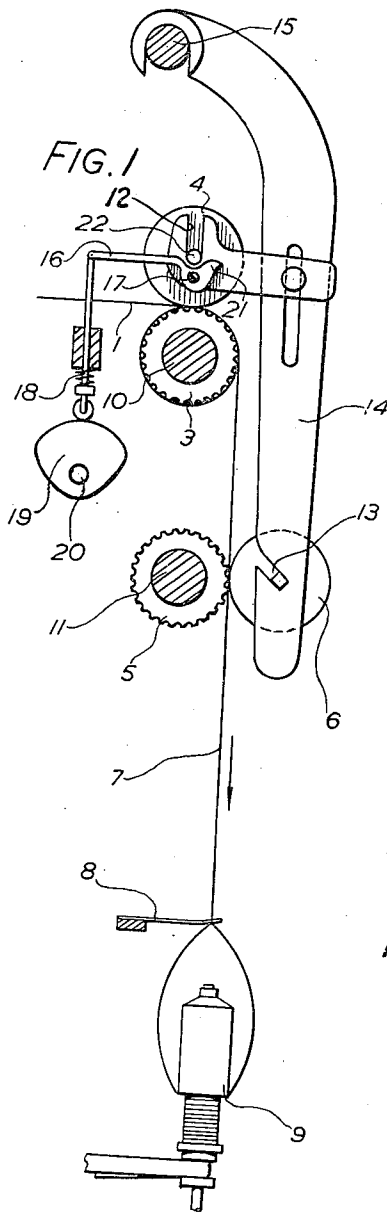


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W. I. TAYLOR ET AL
 PRODUCTION FROM CONTINUOUS FILAMENTS OF YARNS EXHIBITING
 THE CHARACTERISTICS OF STAPLE FIBER YARNS
 Filed July 29, 1937

2,247,529

2 Sheets-Sheet 1



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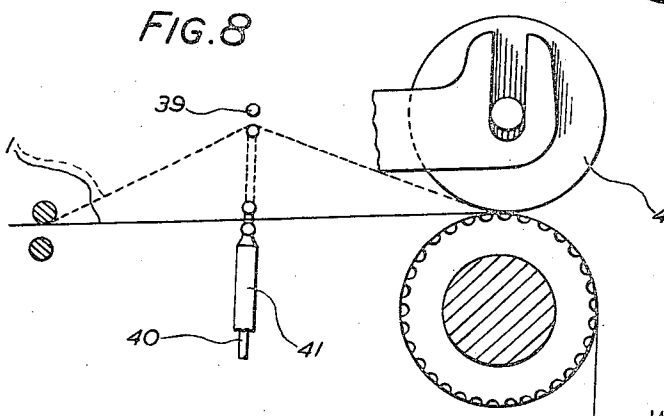
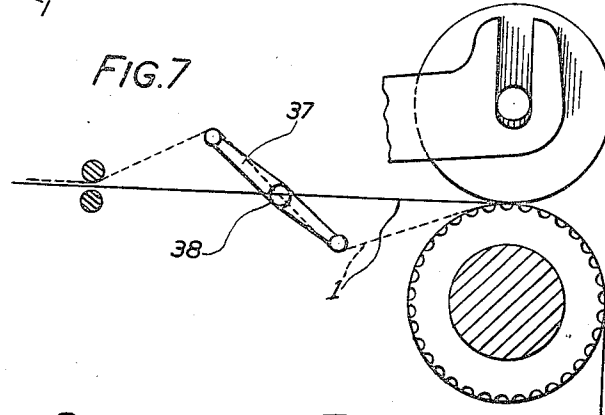
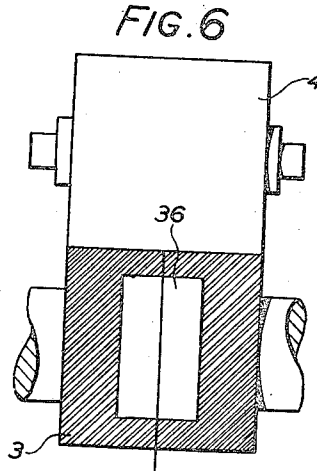
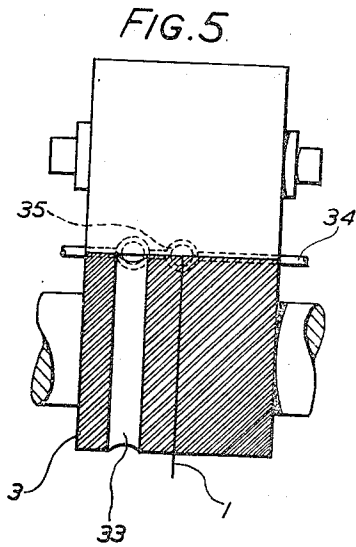
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2,247,529

PRODUCTION FROM CONTINUOUS FILAMENTS OF YARNS EXHIBITING THE CHARACTERISTICS OF STAPLE FIBER YARNS

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14 Claims. (Cl. 19—1)

This invention relates to textile operations, and in particular to the production from continuous filaments of yarns exhibiting the characteristics of staple fiber yarns.

U. S. Patents Nos. 2,077,078 and 2,077,079 describe the conversion of continuous filaments into staple fiber products by causing a bundle of continuous filaments to pass in contact with a cutting surface moving in the same general direction as the filaments but at a different speed therefrom and pressing the filaments against the cutting surface substantially at a point in their length. The bundle of continuous filaments is converted into a continuous staple fiber product by the cutting action thus exerted on individual filaments in the bundle.

According to the present invention the cutting action of a process of the type above outlined is applied intermittently along the length of a bundle of continuous filaments so as to produce a product that exhibits at corresponding intervals and in alternation with each other the characteristics of both a continuous filament product and a staple fiber product. The process according to the invention can be carried out either by varying at the desired intervals the action of the moving cutting surface over which the filaments are passed in sliding contact or by operating on materials that at the desired intervals have a different behaviour on being subjected to the action of the cutting surface, or by a combination of both these expedients.

In order to vary the action of the cutting surface, numerous mechanical modifications or additions may be made in the cutting apparatus, comprising the cutting surface and the means for pressing the filaments against the cutting surface.

These modifications will now be described with reference to the accompanying drawings, in which—

Fig. 1 is a diagrammatic side elevation of one form of cutting apparatus as modified in accordance with the present invention; and

Figs. 2-3 show further modifications of the apparatus in accordance with the invention.

In Fig. 1 a bundle of filaments 1 is drawn from a suitable source of supply and proceeds between two rollers 3, 4 of which the lower roller 3 is a cutting roller provided with sharp-edged helical flutes which under the pressure of the upper roller 4, sever the filaments to form staple fibers. The upper roller 4 is a pressing roller having a hard surface in the form of a metal sleeve which may be supported by a body of sponge rubber. The filaments are drawn through the rollers 3 and 4

by means of a pair of gripping rollers 5 and 6 of which the roller 5 is fluted parallel to its axis, the flutes in this case not having sharp edges while the roller 6 has a surface of rubber. From the gripping rollers 5 and 6 the staple fiber product 7 is fed to the guide 8 of the cap spinning device 9 by means of which it is twisted and wound as a yarn. The rollers 3 and 5 are carried on shafts 10 and 11 positively driven at suitable speeds, while the rollers 4 and 6 are carried in slotted bearings 12 and 13 in an arm 14 hanging from a shaft 15. The speeds of the shafts 10 and 11 are such that the filaments passing between the rollers 3 and 4 move at a speed different from the peripheral speed of the roller 3, so that the individual filaments, when pressed in contact with the roller 3 by the roller 4, are repeatedly severed by the edges of the flutes in the surface of the roller 3, and are converted into a continuous product containing staple fibers.

In accordance with the present invention the pressure between the rollers 3 and 4, which is ordinarily occasioned by the weight of the roller 4, is intermittently relieved by means of a lever 16 pivoted at 17 and actuated through a rod 18 from a cam 19 on a shaft 20. The toe 21 of the lever 16 acts on the spindle 22 of the roller 4 and lifts it at intervals. As a result the filaments 1 passing between the rollers 3 and 4 are repeatedly severed to form the staple fiber product 7 so long as the weight of the roller 4 is resting on the roller 3. When the weight of the roller 4, however, is taken from the roller 3 by means of the lever 16 actuated by the cam 19 this severing action does not take place, and the continuous filament bundle 1 proceeds as such through the rollers 3, 4 and on to the rollers 5, 6 and to the twisting device 9.

Other methods of relieving the pressure with which the filaments 1 are pressed against the cutting roller 3 are shown in Figs. 2, 3, 4 and 5. In Fig. 2 a pressing roller 4 is provided, whose weight is insufficient to cause the severing of the filaments by the cutting roller 3. The weight of the roller 4, however, is augmented at intervals by means of a spring 23 connected through a cam follower 24 to a rotating cam 25 which causes the spring to be compressed at intervals and so causes the roller 4 to press on the roller 3 with sufficient force to cause severance of the filaments. The pressure of the spring 23 is transmitted to the roller 4 by means of a saddle 26 acting on the spindle 22 of the roller 4, the saddle 26 being provided with a thumb piece 27 by means of which the spring 23 may be compressed by hand so that

the roller 4 may be removed when desired from the slotted bearings 12. The spindle 22 emerges from the slotted bearings at a gap 28 in one side of the bearings.

In Fig. 3 is shown a modification of the pressing roller 4, part of the sleeve 29, with which the roller 4 is covered being cut away over part of the circumference of the roller to expose the sponge rubber core 30 of the roller beneath. The roller 4 is still driven round by contact with the roller 3 at the outer portions 31 in contact with which the filaments do not pass. When the filaments are passing between the cut away portion 30 of the roller 4 and the roller 3 they are not severed by the roller 3, but when the cut away portion has passed the nip between the rollers, the pressure with which the filaments are pressed against the roller 3 is sufficient to cause severing.

A modification similar in character to that of Fig. 3 is shown in Fig. 4 in which case the cutting roller 3 has part of its surface cut away at 32 while the pressing roller 4 is left whole. If desired the modifications of Figs. 3 and 4 may be employed simultaneously.

In Fig. 5 a pair of rollers is shown in which the cutting roller 3 has a groove 33 cut all the way round its surface at a point axially removed from the middle of the nip between the rollers. As the filaments pass through the middle of the nip they are severed by the flutes on the cutting roller 3. A yarn traverse rod 34 is provided, however, having a yarn guide 35 mounted thereon, and the yarn guide 35 is moved at intervals so as to cause the filaments 1 to run into the groove 33 so that they are not severed. In this way the filament bundle is alternately severed and not severed over different parts of its length according to the movements of the yarn traverse rod 34.

In the modification shown in Fig. 6 the variation in the cutting effect upon the filaments is obtained by modifying the nature of the surface of the cutting roller 3. This is done by interrupting the flutes in the surface of the roller 3 over an area 36, this area being left highly polished so that it has no cutting action upon the filaments passing between it and the pressing roller 4. The apparatus may be further modified by making both the rollers 3 and 4 cutting rollers with helical flutes and by interrupting the flutes over one or more areas on each roller. In this case severing will take place by means of one or other of the rollers unless a plain part of each roller is in contact with the other, in which case no cutting takes place.

In Fig. 7 the cutting action of the roller 3 is varied by varying the tension with which the filament bundle is fed between the rollers. If the filaments proceeding between the rollers are under a high tension cutting of the filaments by means of the flutes on the surface of the roller 3 does not take place. Accordingly in this modification a double armed lever 37 pivoted on an axis 38 is provided and this lever is oscillated so that it alternately imposes and releases tension on the filaments 1.

In Fig. 8 a variation in the cutting effect is obtained by varying the angle at which the filaments are fed between the rollers. A yarn guide 39 mounted on a push rod 40 sliding in a sleeve 41 is provided, which lifts the filaments 1 at intervals above the normal line at which they proceed to the rollers 3, 4. This lifting of the filaments tends to lift the roller 4, and so reduces the pressure with which the roller 4 presses the filaments against the cutting roller 3, and prevents cutting

of the filaments taking place. This effect is augmented by an increase in the tension of the filaments that takes place when they are lifted by means of the guide 39.

Alternatively or in addition to the employment of the modifications described above, the bundle of filaments may be intermittently sized, waxed, lubricated or otherwise treated so as to provide mechanical resistance to the cutting action at the treated portions. Again, the filaments themselves may offer varying degrees of resistance to the cutting action as by intermittently varying in diameter or by being intermittently strained or otherwise having their material modified, e. g. in the case of continuous filaments of cellulose acetate or other cellulose ester, by saponification. The filaments may likewise be partially coalesced at intervals along their length, or intermittently softened as, for example, by treatment with water, or solvents or partial solvents, such as in the case of cellulose acetate filaments, alcohol and acetone, suitably diluted with water or other non-solvent if necessary. The filaments may also be electrified intermittently along their length so as to cause a spreading of the filaments to take place in the electrified portions thus assisting the cutting action of the rollers.

The intermittent treatment of the bundle of filaments may be regular or irregular. Recurring groups of treated and untreated portions of different lengths may appear in the final product, or the intermittent treatment may be such that no repetition of the intermittent effect occurs in the product, which might give rise to undesired patterning in the fabrics in which it is used. Any suitable regularly or irregularly operating cams or other devices may be employed to effect the intermittent motions necessary with some of the devices described above, such as the relieving or increasing of the pressure or varying of the tension of the filaments.

Having described our invention, what we desire to secure by Letters Patent is:

1. Method of converting a bundle of continuous filaments into a continuous product containing staple fibers, said method comprising passing a bundle of continuous filaments in sliding contact with a moving cutting surface, pressing said bundle against said cutting surface so as to cause filaments in the bundle to be severed and at frequent intervals to form staple fibers, and intermittently and at substantial intervals varying the cutting effect of said cutting surface whereby such severance of the filaments takes place only at said substantial intervals along the length of the continuous filament bundle, so that said bundle is converted into a continuous product that at substantial intervals along its length alternately consists of continuous filaments and contains staple fibers.

2. Method of converting a bundle of continuous filaments into a continuous product containing staple fibers, said method comprising passing a bundle of continuous filaments in sliding contact with a moving cutting surface, pressing said bundle against said cutting surface so as to cause filaments in said bundle to be severed and at frequent intervals to form staple fibers, and intermittently and at substantial intervals varying the resistance to cutting of the continuous filaments at intervals along their length so as to vary the cutting effect on the filaments of said cutting surface, whereby such severance of the filaments takes place only at said substantial intervals along the length of the continuous fila-

ment bundle, so that said bundle is converted into a continuous product that at substantial intervals along its length alternately consists of continuous filaments and contains staple fibers.

3. Method of converting a bundle of continuous filaments into a continuous product containing staple fibers, said method comprising treating a bundle of continuous filaments at substantial intervals with a material adapted to resist the cutting action, passing said bundle in sliding contact with a moving cutting surface and pressing said bundle against said cutting surface so as to cause filaments in said bundle to be severed and at frequent intervals to form staple fibers, said material intermittently varying the resistance to cutting of said filaments whereby such severance of the filaments takes place only at said substantial intervals along the length of the continuous filament bundle, so that said bundle is converted into a continuous product that at substantial intervals along its length alternately consists of continuous filaments and contains staple fibers.

4. Method of converting a bundle of continuous filaments into a continuous product containing staple fibers, said method comprising treating a bundle of continuous filaments at substantial intervals along their length with an agent adapted to vary the hardness of the bundle, passing said bundle in sliding contact with a moving cutting surface and pressing said bundle against said cutting surface so as to cause filaments in said bundle to be severed and at frequent intervals to form staple fibers, said treating agent intermittently varying the resistance to cutting of said filaments whereby such severance of the filaments takes place only at said substantial intervals along the length of the continuous filament bundle, so that said bundle is converted into a continuous product that at substantial intervals along its length alternately consists of continuous filaments and contains staple fibers.

5. Method of converting a bundle of continuous filaments into a continuous product containing staple fibers, said method comprising passing a bundle of continuous filaments in sliding contact with a moving cutting surface, pressing said bundle against said cutting surface so as to cause filaments in said bundle to be severed and at frequent intervals to form staple fibers, and electrifying the filaments at substantial intervals along their length so as to cause spreading of the filaments by mutual repulsion over the cutting surface and to vary the cutting effect on the filaments of said cutting surface whereby such severance of the filaments takes place only at said substantial intervals along the length of the continuous filament bundle, so that said bundle is converted into a continuous product that at substantial intervals along its length alternately consists of continuous filaments and contains staple fibers.

6. Method of converting a bundle of continuous filaments into a continuous product containing staple fibers, said method comprising passing a bundle of continuous filaments which filaments are of a denier that at substantial intervals varies along their length in sliding contact with a moving cutting surface and pressing said bundle against said cutting surface so as to cause filaments in said bundle to be severed and at frequent intervals to form staple fibers, the variation in denier of the filaments varying their resistance to cutting whereby such severance of the filaments takes place only at said substantial

intervals along the length of the continuous filament bundle, so that said bundle is converted into a continuous product that at substantial intervals along its length alternately consists of continuous filaments and contains staple fibers.

7. Apparatus for converting a bundle of continuous filaments into a continuous product containing staple fibers, said apparatus comprising a movable cutting surface, means for causing a bundle of filaments to pass in sliding contact with said cutting surface, means for pressing the bundle against said cutting surface so as to enable filaments in the bundle to be cut into staple fibers, and means for causing the cutting surface to exert a cutting action on the filaments only at intervals along the length of the bundle, so that severance of filaments in the bundle into staple fibers is effected only at such intervals.

8. Apparatus for converting a bundle of continuous filaments into a continuous product containing staple fibers, said apparatus comprising a pair of members adapted to contact with each other, means for causing a bundle of filaments to pass between said members and in sliding contact therewith at least one of said members being a cutting member for the purpose of severing filaments in said bundle and at least one having part of its surface modified so as to interrupt the cutting action on the filaments in the bundle when the filaments fall between said modified part and the surface of the other contacting member whereby the severance of filaments in the bundle into staple fibers is effected only at intervals along the length of the bundle.

9. Apparatus for converting a bundle of continuous filaments into a continuous product containing staple fibers, said apparatus comprising a pair of rollers in contact with each other, means for causing a bundle of filaments to pass between said rollers and in sliding contact therewith, at least one of said rollers having a surface provided with helical flutes for the purpose of severing filaments in the bundle, part of said surface being free from such helical flutes so as to interrupt the cutting action on the filaments in the bundle when the filaments fall between said part of the surface and the other roller, whereby the severance of filaments in the bundle into staple fibers is effected only at intervals along the length of the bundle.

10. Apparatus for converting a bundle of continuous filaments into a continuous product containing staple fibers, said apparatus comprising a pair of rollers in contact with each other, means for causing a bundle of filaments to pass between said rollers and in sliding contact therewith, at least one of said rollers having a surface provided with helical flutes for the purpose of severing the filaments passing between said rollers, part of said surface being recessed so as to interrupt the cutting action on the filaments in the bundle when the filaments fall between said part of the surface and the other roller, whereby the severance of filaments in the bundle into staple fibers is effected only at intervals along the length of the bundle.

11. Apparatus for converting a bundle of continuous filaments into a continuous product containing staple fibers, said apparatus comprising a pair of rollers in contact with each other, means for causing a bundle of filaments to pass between said rollers and in sliding contact therewith, at least one of said rollers having a surface provided with helical flutes for the purpose of sever-

ing the filaments passing between said rollers, said surface having a recess in the form of a circumferential groove round its periphery so as to interrupt the cutting action on the filaments in the bundle when the filaments fall between said groove and the surface of the other roller, and yarn guide means for guiding the bundle of filaments alternately into and out of said groove whereby the severance of filaments in the bundle into staple fibers is effected only at intervals along the length of the bundle.

12. Apparatus for converting a bundle of continuous filaments into a continuous product containing staple fibers, said apparatus comprising a movable cutting surface, means for causing a bundle of filaments to pass in sliding contact with said cutting surface, means for pressing the bundle against said cutting surface and means for varying at intervals the pressure upon said bundle so as to cause the cutting surface to exert a cutting action on the filaments only at intervals along the length of the bundle, so that severance of filaments in the bundle into staple fibers is effected only at such intervals.

13. Apparatus for converting a bundle of continuous filaments into a continuous product containing staple fibers, said apparatus comprising a movable cutting surface, means for causing a

bundle of filaments to pass in sliding contact with said cutting surface, means for pressing the bundle against said cutting surface and means for modifying at intervals the path of the yarn with respect to the nip between the contacting surfaces so as to cause the cutting surface to exert a cutting action on the filaments only at intervals along the length of the bundle, so that severance of filaments in the bundle into staple fibers is effected only at such intervals.

14. Apparatus for converting a bundle of continuous filaments into a continuous product containing staple fibers, said apparatus comprising a movable cutting surface, means for causing a bundle of filaments to pass in sliding contact with said cutting surface, means for pressing the bundle against said cutting surface and means for modifying at intervals the path of the yarn with respect to the nip between the contacting surfaces so as to vary at intervals the tension of the filaments passing over the cutting surface and to cause the cutting action on the filaments only at intervals along the length of the bundle, so that severance of filaments in the bundle into staple fibers is effected only at such intervals.

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