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APPARATUS FOR CONVERTING CONTINUOUS FILAMENTS INTO PRODUCTS CONTAINING STAPLE FIBERS

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FIG. 1

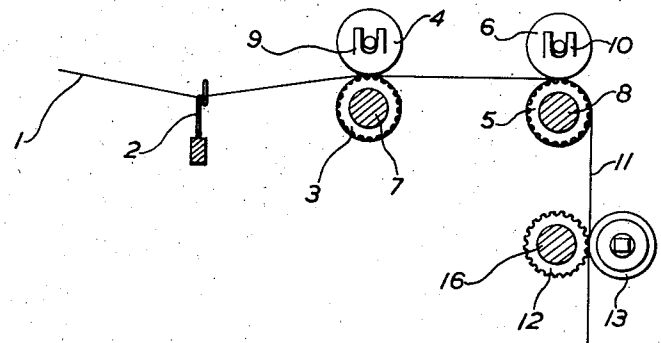
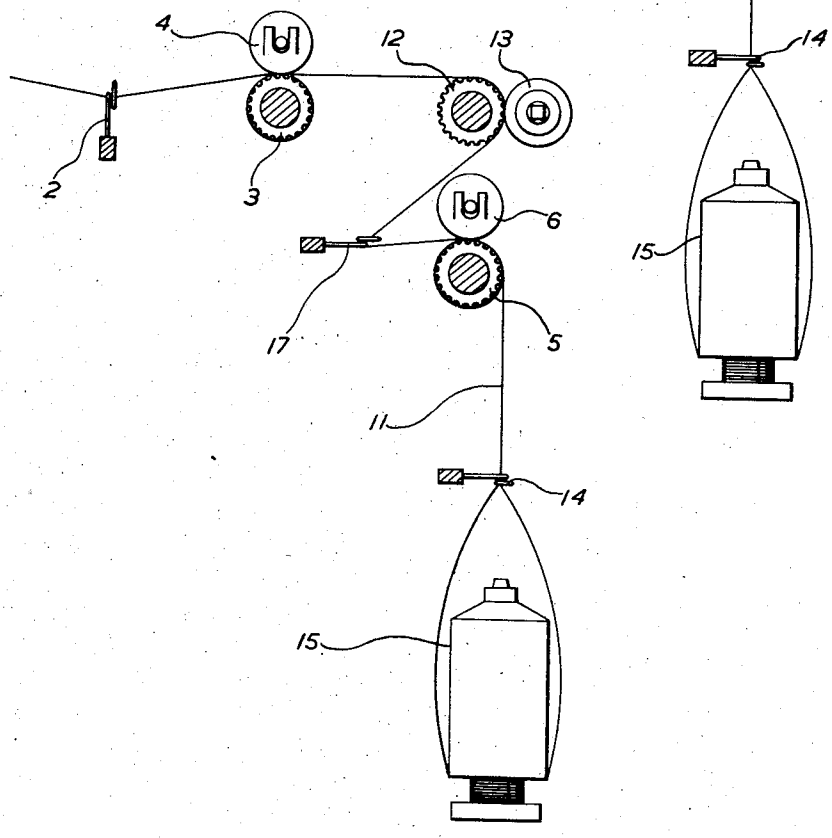


FIG. 2



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APPARATUS FOR CONVERTING CONTINUOUS FILAMENTS INTO PRODUCTS CONTAINING STAPLE FIBERS

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13 Claims. (Cl. 117—1)

This invention relates to the conversion of continuous filaments directly into products containing staple fibers.

U. S. Patents Nos. 2,077,078 and 2,077,079, describe the conversion of continuous filaments into products containing staple fibers 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 substantially at a point in their length against the cutting surface. The filaments, as is indicated in U. S. Patent No. 2,077,078, may be passed more than once through a device comprising a cutting surface adapted to be actuated as indicated above (hereinafter referred to as a "cutting device") or in a single operation they may be subjected to the action of two or more cutting devices in turn.

According to the present invention a bundle of continuous filaments is passed through two cutting devices in turn, the cutting surface of the first device moving at a speed lower than that of the filaments and the second at a speed greater than that of the filaments. By the use of the two devices greater control is obtained over the lengths of the fibers in the product and in particular the retention in the products of exceptionally long fibers is avoided. During the subjection of the bundle to the cutting action of the second device, i. e. the device having greater speed of cutting surface than the filament speed, twist may be inserted in the bundle as an aid in the controlling of the frequency of cut and also to impart strength to the product. A preferred form of cutting device comprises a roller having a fluted surface operating in conjunction with a non-cutting pressing roller, pressure exerted by one roller against the other enabling the flutes of the cutting surface to have the required cutting action on the filaments in the bundle. The bundle of filaments to be treated may contain little or no twist. If desired, however, the bundle may contain several turns of twist per inch. Some or all of this twist may be inserted by drawing the filaments from a rotating twisting bobbin.

Two forms of apparatus according to the invention will now be described in greater detail with reference to the accompanying drawing, in which

Fig. 1 is a diagrammatic side elevation of one form of apparatus for carrying out the invention; and

Fig. 2 is a diagrammatic side elevation of the other form of apparatus for carrying out the invention.

As is shown in Fig. 1 a bundle of filaments 1 is drawn from a source of supply through a guide 2, thence first through one cutting device comprising a pair of rollers 3, 4 and thence through another cutting device comprising a pair of rollers 5, 6. The lower rollers 3 and 5 are mounted on driven shafts 7, 8, while the upper rollers 4 and 6 are carried in slotted bearings 9, 10. The bundle of filaments issues from the nip of the second pair of rollers 5, 6 in the form of a continuous staple fiber product 11 which passes through a pair of gripping rollers 12, 13 and thence to the balloon guide 14 of a cap spinning device 15 by means of which the filamentary product 11 is twisted and collected as a yarn. The gripping rollers 12, 13 (of which the roller 12 is mounted on a driven shaft 16) serve to draw the staple fiber product through and from the two cutting devices, and the three shafts 7, 8 and 16 are driven at such rates that the peripheral speed of the gripping rollers 12, 13 is greater than that of the rollers 3, 4 and less than that of the rollers 5, 6. Preferably the gripping rollers are driven at about 2–2½ times the speed of the first cutting rollers and the second cutting rollers at about 2–2½ times the speed of the gripping rollers.

The rollers 4 and 6 are so weighted as to exert the desired pressure upon the filaments in the nips between the pair of rollers 3, 4 and the pair of rollers 5, 6, and suitable weights or springs are employed to cause the gripping roller 13 to press against the driven gripping roller 12 and grip the filaments firmly. The rollers 3 and 5 are provided with sharp edged helical flutes which, under the pressure applied by the rollers 4 and 6, serve to sever the filaments as the filaments pass through the nips, while the rollers 4 and 6 have a surface in the form of a smooth, metal sleeve which may be mounted on a body of sponge rubber. The gripping roller 12 is also fluted, the flutes in this case being free from sharp edges and parallel to the axis of the roller, while the roller 13 has a surface of rubber.

In the form of apparatus shown in Fig. 2 the gripping rollers 12, 13 are disposed between the two cutting devices constituted by the rollers 3, 4 and 5, 6. Here the gripping rollers serve to draw the continuous filament bundle 1 from the source of supply and through the guide 2 and through the first cutting device 3, 4, the second cutting device 5, 6 drawing the filaments from the gripping rollers 12, 13 through a guide 17, and delivering the staple fiber product 11 directly to the guide 14 of the cap spinning device 15. In this form of apparatus the twist imparted by the

cap spinning device 15 is permitted to run back into the nip of the second cutting device. This assists in controlling the frequency of the cutting and further imparts strength to the product passing through the second cutting device.

In this case also a convenient speed ratio for the rollers is the ratio of 2:2½ between the first pair of rollers and the gripping rollers and 2:2½ between the gripping rollers and the second cutting device, the peripheral speeds in this instance increasing successively from the cutting device to gripping rollers and then to cutting device.

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

1. Method of producing a continuous staple fiber product from a bundle of continuous filaments, comprising passing the bundle of continuous filaments in contact with two cutting surfaces in turn, pressing the filaments against each of said cutting surfaces and moving the first of said cutting surfaces at a linear speed less than that of the filaments and the second cutting surface at a linear speed greater than that of the filaments.

2. Method of producing a continuous staple fiber product from a bundle of continuous filaments, comprising passing the bundle of continuous filaments in contact with two cutting surfaces in turn, pressing the filaments against each of said cutting surfaces, moving the first of said cutting surfaces at a linear speed less than that of the filaments and the second cutting surface at a linear speed greater than that of the filaments, and inserting twist in the bundle of filaments during the subjection of the bundle to the cutting action of the faster moving cutting surface.

3. Method of producing a continuous staple fiber product from a bundle of continuous filaments, comprising passing the bundle of continuous filaments in contact with two cutting surfaces in turn, pressing the filaments against each of said cutting surfaces, moving the first of said cutting surfaces at a linear speed less than that of the filaments and the second cutting surface at a linear speed greater than that of the filaments, and submitting the continuous staple fiber product leaving the second cutting surface to a twisting and winding operation.

4. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices each having a moving cutting surface and means for pressing the bundle of filaments against said cutting surface, means for drawing the bundle of filaments through said cutting devices in turn and means for moving the first of said cutting surfaces at a linear speed lower than that of the filaments and the second of said cutting surfaces at a linear speed greater than that of the filaments.

5. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices, each having a pair of rollers one at least of which has a cutting surface, and means for pressing said rollers together so as to press a bundle of filaments passing between said rollers against said cutting surface, means for drawing a bundle of filaments through said pairs of rollers in turn, and means for driving a cutting roller in the first pair of rollers at a peripheral speed less than the speed of the filaments and a cutting roller in the second pair of rollers at a peripheral speed greater than the speed of the filaments.

6. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices each having a pair of rollers one at least of which has a cutting surface, and means for pressing said rollers together so as to press a bundle of filaments passing between said rollers against said cutting surface, a pair of gripping rollers adapted to draw a bundle of filaments through at least one of said pairs of rollers, and means for driving a cutting roller in the first cutting device at a less peripheral speed than said gripping rollers and a cutting roller in the second cutting device at a greater peripheral speed than said gripping rollers.

7. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices, each having a pair of rollers one at least of which has a cutting surface, and means for pressing said rollers together so as to press a bundle of filaments passing between said rollers against said cutting surface, a pair of gripping rollers adapted to draw a bundle of filaments through both of said cutting devices in turn, and means for driving a cutting roller in the first of said cutting devices at a less peripheral speed than said gripping rollers and a cutting roller in the second cutting device at a greater peripheral speed than said gripping rollers.

8. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices, each having a pair of rollers one at least of which has a cutting surface, and means for pressing said rollers together so as to press a bundle of filaments passing between said rollers against said cutting surface, a pair of gripping rollers disposed between said cutting devices and adapted to draw a bundle of filaments through one of said cutting devices and to forward it to the other of said cutting devices, and means for driving a cutting roller in the first of said cutting devices at a less peripheral speed than said gripping rollers and a cutting roller in the second cutting device at a greater peripheral speed than said gripping rollers.

9. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices, each having a pair of rollers one at least of which has a cutting surface, and means for pressing said rollers together so as to press a bundle of filaments passing between said rollers against said cutting surface, a pair of gripping rollers adapted to draw a bundle of filaments through both of said cutting devices in turn, means for driving a cutting roller in the first of said cutting devices at a less peripheral speed than said gripping rollers and a cutting roller in the second cutting device at a greater peripheral speed than said gripping rollers, and a twisting and winding device adapted to collect the continuous staple fiber product coming from said gripping rollers.

10. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices each having a pair of rollers one at least of which has a cutting surface, and means for pressing said rollers together so as to press a bundle of filaments passing between said rollers against said cutting surface, a pair of gripping rollers disposed between said cutting devices and adapted to draw a bundle of filaments through one of said cutting devices and to forward it to

the other of said cutting devices, means for driving a cutting roller in the first of said cutting devices at a less peripheral speed than said gripping rollers and a cutting roller in the second cutting device at a greater peripheral speed than said gripping rollers, and a twisting and winding device adapted to collect the continuous staple fiber product coming from the second of said cutting devices.

11. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices each having a moving cutting surface provided with sharp-edged flutes disposed at an angle to the direction of motion of said surface, and means for pressing the bundle of filaments against said cutting surface, means for drawing the bundle of filaments through said cutting devices in turn and means for moving the first of said cutting surfaces at a linear speed lower than that of the filaments and the second of said cutting surfaces at a linear speed greater than that of the filaments.

12. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices, each having a pair of rollers one at least of which has a cutting surface having sharp-edged helical flutes, and means for pressing said rollers together so as to press a bundle of filaments passing between said rollers against said cutting surface, a pair of gripping rollers adapted to draw a bundle of filaments through both of said cutting devices in turn, means for driving a cutting roller in the first of said cutting devices at a less peripheral speed than said gripping rollers and a cutting roller in the second cutting device at a greater peripheral speed than said gripping rollers, and a twisting and winding device adapted to collect the continuous staple fiber product coming from said gripping rollers.

13. Apparatus for the production of a continuous staple fiber product from a bundle of continuous filaments, said apparatus comprising two cutting devices each having a pair of rollers one at least of which has a cutting surface having sharp-edged helical flutes, and means for pressing said rollers together so as to press a bundle of filaments passing between said rollers against said cutting surface, a pair of gripping rollers disposed between said cutting devices and adapted to draw a bundle of filaments through one of said cutting devices and to forward it to the other of said cutting devices, means for driving a cutting roller in the first of said cutting devices at a less peripheral speed than said gripping rollers and a cutting roller in the second cutting device at a greater peripheral speed than said gripping rollers, and a twisting and winding device adapted to collect the continuous staple fiber product coming from the second of said cutting devices.

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