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PROCESS AND DEVICE FOR CUTTING FIBERS IN ROPE FORM, ESPECIALLY SYNTHETIC FIBERS

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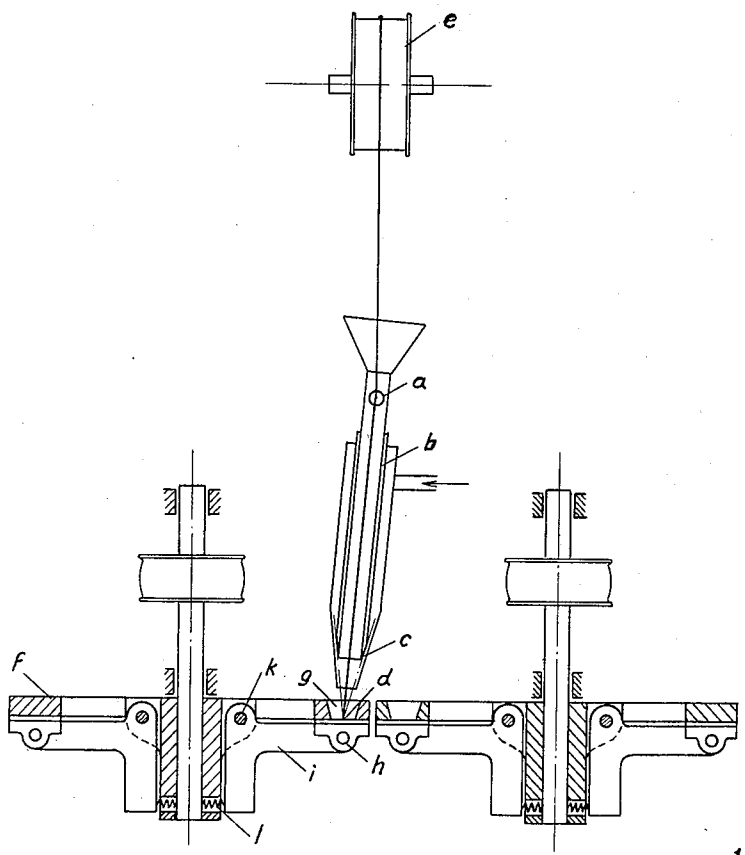

Fig. 1

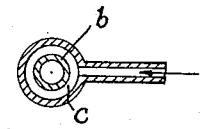

Fig. 3

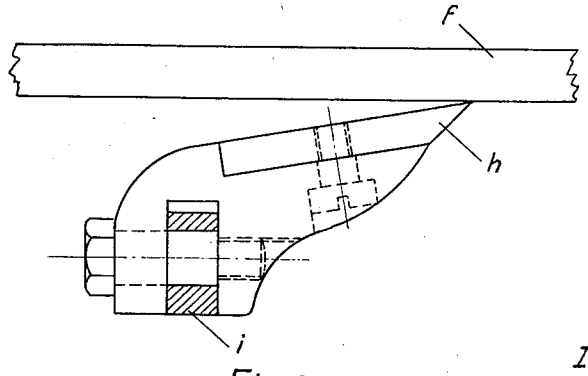

Fig. 2

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PROCESS AND DEVICE FOR CUTTING FIBERS IN ROPE FORM, ESPECIALLY SYNTHETIC FIBERS

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11 Claims. (Cl. 164—17)

This invention relates to a process and a device for the continuous cutting into staple fiber of endless ropes of fiber such as coming from spinning machines. Heretofore many difficulties were encountered in cutting endless ropes of fiber; they were due principally to the relatively high speed at which such fiber ropes leave the spinning machine and to the great number of cuts necessary to produce a given length of staple. Such difficulties were aggravated by the fact that the rope leaving the spinning machine has to be under permanent and even tension in order to yield smooth cuts and staple of absolutely even length.

Furthermore, the wet and slippery fibers of the rope have a tendency to escape the cutting action of the knives, if the latter have the least amount of play. This results in tearing rather than cutting of the fiber and producing staple of uneven length. An absolute uniformity of the length of staple is however most essential in order to render the staple suitable for the subsequent process of spinning it into yarn.

The processes known heretofore did not overcome the above difficulties. For instance, a well-known process exposes the rope of fiber coming from the spinning machine to force and whips the end of the swing rope against stationary cutting knives which cut the fibers at lengths determined by the speed at which the fiber rope is fed, the number of stationary knives employed and the number of turns of the disk which swings the fiber rope around. This process has shown the disadvantage that very high disk speeds must be used in order to get sufficient centrifugal pull and momentum. On the other hand, the fibers constituting the rope are usually only of light weight and the pull exerted on them by centrifugal force will for this reason be slight and unsufficient. A further disadvantage is that the fibers in the rope receive a twist of one turn by each revolution of the disk, which also results in nonuniform length of staple. Furthermore, the stationary knives referred to before have to have a certain amount of play to permit the disk to rotate freely and with high speed. Such play may cause, especially after long use, some fibers to miss the knife edge with the result that staple of twice the required length is produced which is very objectionable.

Another known system makes use of a transporting belt or roll to advance the rope of fiber and provides a rotating knife roll for cutting. The knives in this case are mounted in such a way that they just about touch the transporting means. Consequently, as the knives wear, and that takes place after a short while, they produce uneven and incomplete cuts, causing loss of material and interruption of the line. It has also been tried to cut the fiber at the point where it leaves the spinnerette. This system requires so many individual cutting knives that it is not feasible. It is also not desirable, because the chemical reaction taking place in the fiber is still incomplete at this point.

The instant invention eliminates the disadvantages of the prior art, as described above. The appended drawing schematically illustrates the object of this invention.

Fig. 1 is a cross-section of the device while Fig. 2 shows the position of the knife in relation to the cutting ring. Fig. 3 is a detail cross-section of the funnel taken at the level of the arrow, which indicates in Fig. 1 the direction of intake of a fluid.

The device consists of a funnel *b* which is swingably mounted at point *a*. The lower end of said funnel is spacedly disposed at the center of an annular jet, designated as *c*. Through the jet *c* water or air is forced under pressure forming at *d* the point of a hollow cone which takes hold of the rope of fibers entering through the funnel and pulls it with smooth and even tension off the roll designated as *e*. The speed at which said roll is rotated controls the speed of the fiber rope. By varying the pressure of the water or air, the rope tension can be regulated within wide limits. The water or air pressure pulls the fiber rope into opening *g* in the stationary cutting ring *f*. Underneath the cutting ring are one or more knives which rotate and cut pieces of fiber off the continuously fed fiber rope. The knives *h* are movably mounted on lever *i*, the fulcrum of *i* being at *k*. As the driving shaft rotates, the knife is constantly pressed by the centrifugal force acting on *i* against the cutting ring *f*. The knife edge therefore rests upon the cutting ring, so that all play is eliminated and a clean and swift cutting action obtained. The resting of the knives on the cutting ring while they rotate results furthermore in the continuous sharpening of the cutting edges of the knives. The knives are therefore always sharp and have to be exchanged at long intervals only. The pressure of the knives against the cutting ring may be increased by springs *l*, if desired. The knives are mounted by way of joints so that the full width of a knife rests on the cutting ring and the full width of the cutting edge is uniformly resharpened.

In order to avoid loss of production through shutdowns, and to permit periodical cleaning, adjusting and inspection, the device is built in the form of a twin construction in such a way that each section incorporates the complete device, one operating entirely independent from the other. The changing from one section to the other is done by swinging funnel *b* around point *a*.

Provision is made for using more than one knife whereby the speed of the knife carrier may at will be considerably reduced, thus reducing the wear between the knife and the cutting ring. The length of the cut staple can also be adjusted by changing the number of knives used and by changing the speed of the knife carrier.

In comparison with other systems the principal advantages of the above described process and the device pertaining to it rest upon the facts that the tension of the fiber rope can be regulated within wide limits and that it may be adapted to the thickness of the fiber rope; that the individual fibers of the rope are not subjected to any twist and that the length of the staple is rendered uniform throughout; that furthermore the efficiency of the device is very high on account of automatic sharpening of the knives and that thereby costs of operation and maintenance are reduced.

The following claims are proposed:

1. Process for cutting a continuously fed filament of fibers, particularly synthetic fibers, consisting in equally exposing said filament upon all sides to and engaging it by the pulling action of a liquid forced by pressure through a suitably formed jet into the opening of a stationary cutting ring against which rotate one or more cutting knives.

2. A rotary device for cutting spun fiber comprising a perforated cutting ring, a feeding means for spun fiber directed onto a perforation in said ring, and a knife mounted to rotate relatively to said ring concentrically to said ring, but movable by way of universal suspension and pressed by centrifugal force with its cutting edge against said cutting ring so that it is automatically resharpened.

3. The method of tautly feeding the free end of a strand of fiber from a feed into a cutting device, comprising directing the hollow blast of a fluid into said cutting device, and guiding said strand centrally into the hollow of said blast, so that it is fed straight into said cutting device in aspirator fashion.

4. The method of tautly feeding the free end of a rope from a feed into a cutting device, comprising, blowing a fluid to form a blast shaped as a hollow cone with an imaginary apex in said cutting device, and guiding said rope centrally into said blast, so that it is fed straight into said cutting device in aspirator fashion.

5. The method of tautly feeding the free end of a rope from a feed into a cutting device, comprising directly the hollow blast of a fluid into said cutting device, and feeding said rope axially into the hollow of said blast.

6. A pair of circular cutting devices adapted to cut a rope at pitch lines near their peripheries, said devices being arranged alongside of each other, and a feed tube for such rope oscillatably arranged above said devices, so that it may be directed at will unto said pitch line of one or the other of said devices.

7. In combination with a cutting device, a feed tube with an outlet directed into said device and a jacket surrounding said tube, open at the outlet of said tube and adapted to be connected to a pressure fluid serving as a blast issuing from said jacket around the outlet of said tube.

8. In a cutting device for textile material, a cutting plate with a circular continuous surface with clearances for the material to be cut, feeding means for directing the material onto one of said clearances, a support rotatable relatively to said plate, and a cutting knife mounted on and rotating with said support but angularly movable relatively to said support into and out of sliding contact with said surface of the cutting plate.

9. In a cutting device, a cutting plate with a circular continuous surface with clearances for the material to be cut, guide means for feeding said material into one of said clearances, a support rotatable relatively to said plate, and a cutting knife mounted on and rotating with said support but movable relatively to said support into and out of sliding contact with said surface of the cutting plate, said knife being balanced so that it is centrifugally pressed onto said surface, when said support is rotated.

10. In a cutting device, a cutting plate with a circular continuous surface with clearances for the material to be cut, guide means for feeding said material into one of said clearances, a support rotatable relatively to said plate, and cutting knives mounted on opposite sides of and rotating with said support but swingable relatively to said support into and out of sliding contact with said surface of the cutting plate.

11. A rotary cutting device comprising a feed, a cutting ring perforated in alignment with said feed, a cutter slidable upon said ring over a perforation of said ring, a lever swivably supporting said cutter, and a supporting element upon which said lever is fulcrumed, said element being coaxially rotatably mounted relatively to said ring, so that said lever presses said cutter onto said ring by reason of the centrifugal momentum tending to swing it around its fulcrum, when said element is rotated.

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