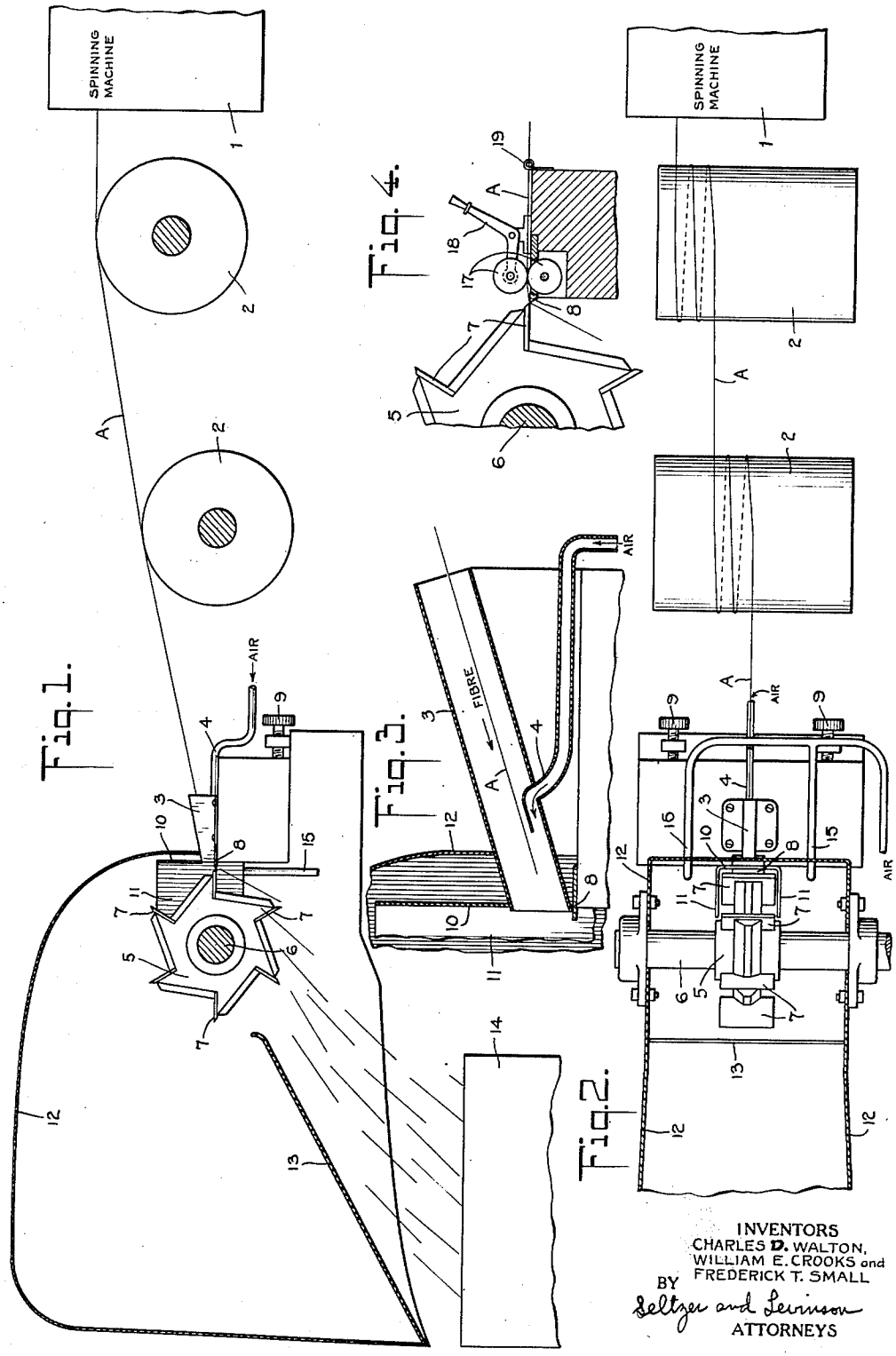
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APPARATUS FOR HANDLING TEXTILE YARNS

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APPARATUS FOR HANDLING TEXTILE YARNS

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This invention relates to the method of and apparatus for handling textile yarns, and relates more particularly to the method of or apparatus for conveying such yarns from place to place and especially for the cutting of such yarns into staples.

An object of our invention is to provide means for conveying yarn or other textile materials by means of air, gas or other pneumatic agency.

A further object of our invention is to provide means for conveying yarns to a device for cutting the same into relatively short staples.

A further object of our invention is to provide means for cutting yarns into shorter pieces continuously, in contradistinction to intermittently, as has been previously done.

A further object of our invention is to provide means for cutting short staples of yarns or textile fibres from bundles that are less bulky than could be cut on other machines.

A further object of our invention is to provide means for cutting yarns that are moving at a higher linear speed, and also for cutting the yarns at a higher frequency, than has been heretofore possible.

A further object of our invention is to provide means for cutting continuously artificial yarns, especially cellulose acetate yarns, directly as they are produced in the spinning machine.

Other objects of our invention will appear from the following detailed description.

In many textile operations, there is frequently great difficulty in transferring or conveying yarns, which are continuously running in practically unlimited lengths, from one point to another. The usual system of guides, loose pulleys and driven pulleys, are often inherently unsatisfactory. It is sometimes impossible to achieve certain results by pulleys, belts, etc. For example—in attempting to convey to a cutting knife, a small bulk of fine filaments, yarns or thread continuously supplied by the spinnerets of an artificial silk spinning machine, we have found that the easily flexible filaments, etc., have not, under certain circumstances, sufficient rigidity to travel forward any reasonably practical distance from a point of delivery preceding the point of cutting.

Hitherto, the cutting of such yarns to staple suitable for the operation commonly called spinning has been done as a discontinuous operation, involving much labor and expense. These items are much reduced by our invention. When our machine is used, any length of yarn can be cut to any shorter length desired without a pause in the operation and at a rate of speed hitherto unattainable. The uniformity of the product is much better than anything previously obtainable.

In the past, production of short lengths of natural and artificial silk, rayon, and cellulose acetate yarns, commonly called staple or staple fibre, has been achieved by discontinuous means. Waste yarns or freshly manufactured yarns, on various packages and in various forms, have been laboriously fed to cutting machines working intermittently and at low speeds. The cutting has involved a great deal of handling, output has been low, odd ends have been wasted, and the product has not been uniform.

In accordance with our invention, we provide means for causing textile yarns or threads to run or flow to a desired point by the use of a gaseous or liquid medium, which can flow along with the yarn and carry the yarn therewith. The yarn may be carried for any desired distance from one point to another, and the yarn may be carried to an apparatus for carrying out any desired operation, such as throwing onto suitable package, doubling, twisting, washing, drying, etc. Another important application of our invention is for the conveying of yarns in a continuous manner to an apparatus for cutting the same into staples, and this use will be specifically described in this application.

The device for cutting the yarn in a continuous manner in accordance with our invention comprises the arrangement of cutting units of knives suitably fitted relative to the feed of the yarn, means for continuously feeding the yarn to the cutting knives and means for collecting the cut staples of yarn. A definite relation is maintained between the rate of feed of the yarn and the frequency of the cuts made by the knives in order to insure uniformity of length of the staples.

In one form of device for carrying out our invention, the yarn is drawn from any suitable package, such as hank, bobbin, etc., or from a machine for the formation of artificial yarns or filaments, and caused to pass around two smooth rollers of suitable dimension, arranged in series. From the second of these two rollers, the yarn is carried forward to the cutting knives by means of a special device, which preferably assumes the form of a tube having an air ejector therein, which causes the yarn to be drawn by suction through the tube behind the ejector and by air blast in advance of the ejector. Instead

of using the pneumatic means for this purpose, two small rollers may be used for conveying the yarn from the second feed roller to the cutting mechanism. The yarn is caused to pass between the two small rollers which are placed close to the cutting device and are arranged to nip the yarn between them and cause the same to pass forward to the cutting edge.

In order further to illustrate our invention, reference is had to the accompanying drawing, wherein

Figure 1 is a vertical section of the device, showing pneumatic means for feeding the yarns to the cutting mechanism.

Figure 2 is a plan of the device shown in Figure 1.

Figure 3 is an enlarged vertical cross sectional view showing the pneumatic feed mechanism in detail, and

Figure 4 is an enlarged detailed vertical cross sectional view showing a modified feeding mechanism comprising small feed rollers.

As shown on the drawing, the yarn to be cut is generally indicated at A. For simplicity, only one strand of yard or thread, is shown. However, in actual operation, a plurality of yarns or threads are cut simultaneously, the yarns or threads to be cut being drawn in close juxtaposition prior to their being cut.

The drawing shows the yarn A being drawn continuously from the spinning machine 1. This spinning machine may be any suitable apparatus for either the dry spinning or wet spinning of artificial yarns containing organic derivatives of cellulose, such as cellulose acetate, or reconstituted cellulose generally known as rayon. Such spinning machines are capable of spinning continuous lengths of filaments without break for a very long period of time at a high rate of speed and, therefore, our invention, which provides for continuous cutting of the yarn into staples at a high rate of speed is of particular advantage for use in connection with spinning machines for the manufacture of artificial filaments or yarns. The filaments as formed from the spinning machine are preferably not twisted prior to cutting into staples, in order to obtain as bulky a product as possible. However, the use of our invention in connection with twisted yarns is not excluded. The yarns or filaments are drawn from any number of spinning machines desired. Instead of having the spinning machine as the direct source of yarn, the yarn to be cut may be fed from bobbins, pirns, hanks or other suitable packages, in which case, not only artificial silk yarn or filament may be cut, but yarns of other fibres, such as natural silk, cotton, wools, etc.

The yarns or filaments to be cut are caused to pass several times around the feed rolls 2, and which are preferably of approximately 50 cm in circumference. These rolls 2 are suitably mounted for rotation and for ready manipulation and cause the yarn or fibre to pass forward to the cutting device.

In the form shown in Figures 1, 2 and 3, the yarn passes from the feed rolls 2, towards the cutting device by the agency of the pneumatic means comprising the tube 3, having therein a nozzle 4 for the ejection of air, which causes a suction behind the same and an air blast in advance thereof, for carrying the yarn to the cutting device.

The cutting device comprises a rotating member 5, mounted on the rotating shaft 6, having any suitable number of blades or knives 7. Although six of such knives 7 are shown on the drawing, any suitable number, say four, five, seven, eight or more may be used. These blades or knives 7 are removably mounted on the member 5, and a spare set of blades or knives may be mounted on a separate device so that in case of necessity of repairs, a new set may be ready to be brought into commission very quickly. The rotating device may be mounted so as to cause the blade 7 to come down on the yarn from the front as shown on the drawing, i. e. in a position parallel to the feed rolls 2; or they may be mounted at any other suitable angles to the feed rolls.

The rotating blade 7 cooperates with the stationary blade 8 for cutting the yarn, which passes between them, and the blades 7 are preferably so fitted relative to the opposing edge of the stationary blade 8, that they have a "leading edge", i. e. a scissors action in effect. In order to obtain fine adjustment of the position of the stationary blade 8 to proper cutting position, the milled head screws 9, having a suitable locking device, are provided.

The length of the staples that are cut may be accurately maintained or varied, by maintaining or varying the rate of rotation of the rotating device 5, in accordance with the rate of feed of the yarn to the cutting device.

In order to prevent the yarn that is about to be cut from being blown back over the nozzle, or from being wiped from side to side, when the flow of air through the ejector 4 is sufficiently large to cause turbulence, we provide baffles around the location where the yarn is to be cut. In the form shown on the drawing, this baffle arrangement comprises the vertical back baffle 10 and the vertical side baffles 11.

The cutting device is provided with the cover 12, and a baffle 13 is provided to guide the cut staples of yarn down toward the receiving bin 14, which is preferably made of wire gauze or other foraminous material to permit the escape of air but to retain the staples of yarn.

In order further to assist the air introduced by the ejector 4 to carry cut yarn away from the cutting edges and the bearings of the cutting device, additional blasts of air may be introduced by the pipes 15. If desired, the receiving bin 14 may be fitted to a chute which is connected to a suction fan for further drawing the cut staples away from the cutting device into the receiving bin 14. Furthermore if desired, a general blast of air may be blown or sucked through or around the cutting area to effect removal of the cut staples. Hot air may be used where this is advantageous, such as in drying off a wet-spun or washed yarn.

In the modification shown in Figure 4, the yarn A is fed to the cutting device by means of the two small nip rollers 17, after having been advanced by the guide rolls 2. These small rollers 17 are preferably of a size of the order of say 4 cm in circumference, and are driven at such a rate, that their circumferences have a linear speed somewhat greater than that of the guide rolls 2. Because of the small size of the nip rolls 17, they may be positioned close to the cutting blades as shown on the drawing so that the yarns may be positively delivered in close proximity to the cutting edges. The handle 18 is provided to lift the upper roller 17 to permit manipulation and a thread guide 19 is mounted for guiding the yarn to the nip rollers

17. As another variation of our invention, the nip rolls 17 may be substituted by an endless belt for carrying the yarn to the cutting edges.

The operation of the apparatus is as follows: The yarn is drawn either from a spinning machine or from any suitable package, and is wound around each of the guide rolls 2 in several turns. The yarn then passes into the tube 3 and is drawn by suction induced by the air ejector 4, and then, by the air blast caused by the ejector, between the cutting edges comprising the rotating blade 7 and the stationary blade 8. The rate of feed of the yarn is so proportioned, that having due consideration for the rapidity of the rate of cuts caused by the rotation of the blade 7, a product of substantially uniform predetermined length is produced. The cut staples of yarn are blown by means of air introduced through the ejector 4, and if desired, by the auxiliary air blast introduced through pipe 15, away from the cutting edges to the collecting bin 14 where they are separated from the air.

By the use of our invention a high frequency of cuts on the order of 4,000, 5,000 or more cuts per minute may be attained. With this rate of speed staples of any lengths from ½" to 2½" and having uniform length are easily produced. Owing to the action of the air, the staples are fluffed, and the finished product is therefore quite bulky,—a property which is very desirable. It will be seen that this device provides for continuous operation of cutting, which is of great commercial advantage.

This invention while it is of general application is particularly suitable for the cutting of yarns made of organic derivatives of cellulose. Examples of such organic derivatives of cellulose are organic esters, such as cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate, or cellulose ethers such as methyl cellulose, ethyl cellulose, benzyl cellulose.

The term "yarn" is employed in the specification and claims to denote not only yarns made by the association together of a plurality of filaments or fibres, but also denotes filaments or fibres which are not associated together by twisting or otherwise.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

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

1. In a device for making staple fibre from a substantially endless supply of filaments, means for cutting said filaments into staples of predetermined length and pneumatic means for feeding said filaments from said supply to said cutting means, said pneumatic means being positioned to keep said filaments drawn out in parallel relation.

2. In a device for making staple fibre from a substantially endless supply of filaments, means for cutting said filaments into staples of predetermined length and means including a tube and an air ejector for feeding said filaments from said supply to said cutting means, said feeding means being positioned to keep said filaments drawn out in parallel relation.

3. In a device for making staple fibre from a substantially endless supply of filaments, means for cutting the filaments into staples of predetermined length and means including a roll and fluid ejecting means for feeding said filaments from said supply to said cutting means, said feeding means being positioned to keep said filaments drawn out in parallel relation.

4. In a device for making staple fibre from a substantially endless supply of filaments, means for cutting the filaments into staples of predetermined length and means including a plurality of rolls and fluid ejecting means for feeding said filaments from said supply to said cutting means, said feeding means being positioned to keep said filaments drawn out in parallel relation.

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