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PROCESS AND APPARATUS FOR THE PRODUCTION OF TEXTILE MATERIALS

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2 Sheets-Sheet 1

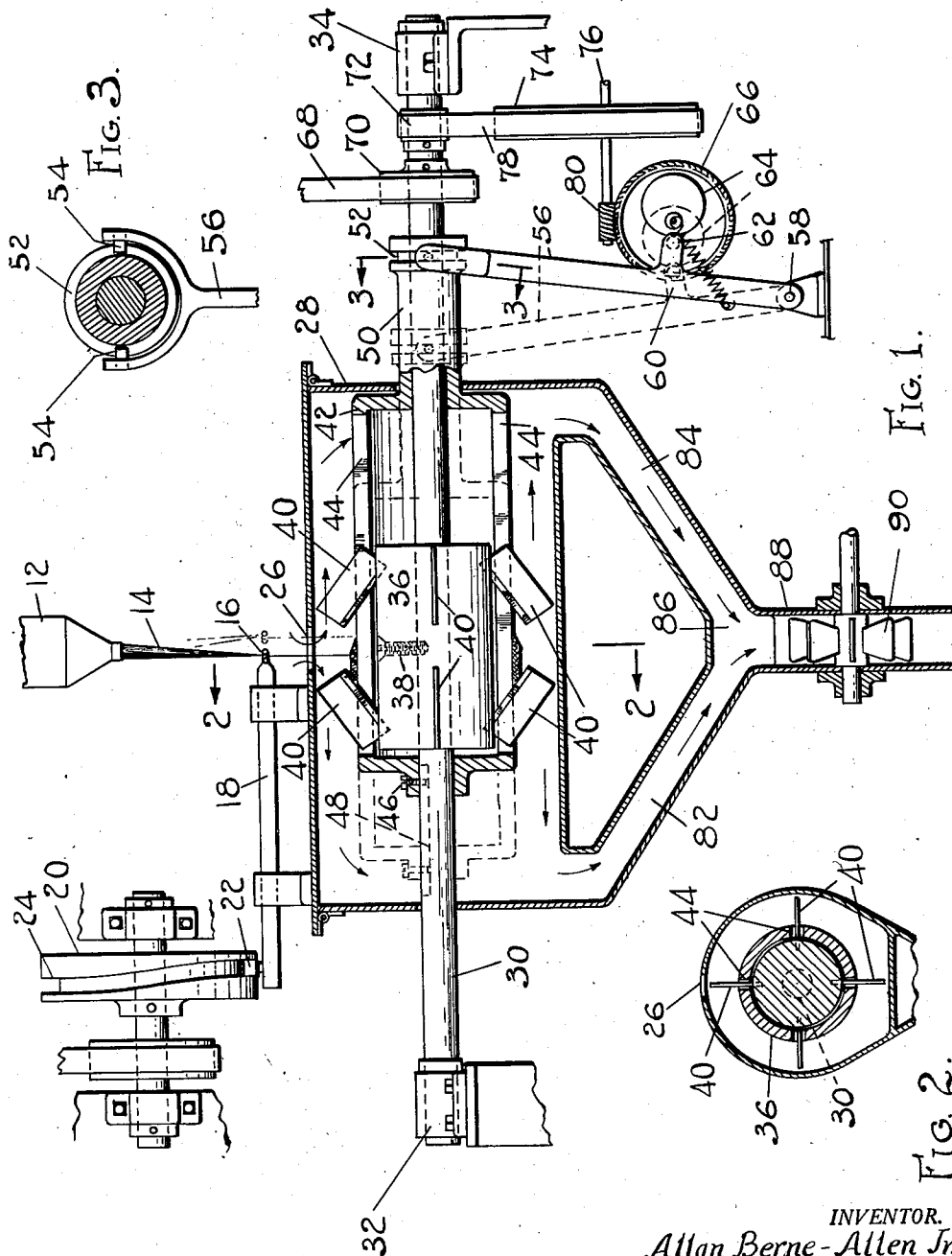


FIG. 2.

FIG. 1.

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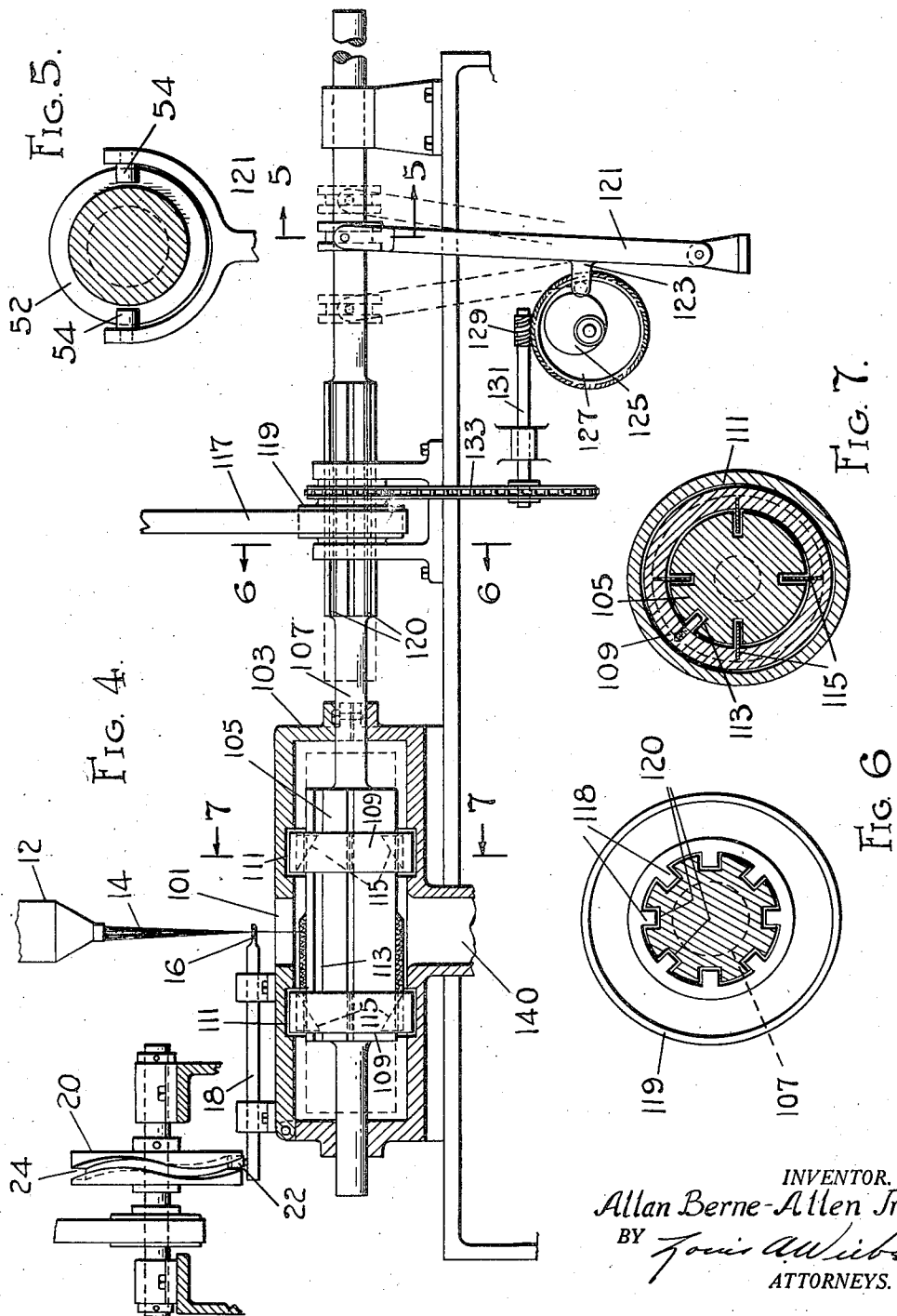
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PROCESS AND APPARATUS FOR THE PRODUCTION OF TEXTILE MATERIALS

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2 Sheets-Sheet 2



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PROCESS AND APPARATUS FOR THE PRODUCTION OF TEXTILE MATERIALS

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9 Claims. (Cl. 164—34)

This invention relates to the production of artificial staple fiber from thread, or the like, and more particularly it relates to the continuous winding of artificial thread or the like on a support and the continuous cutting of said thread into staple lengths.

The invention will be described with particular reference to the winding and cutting into staple lengths of cellulose acetate threads; however, the invention is equally applicable to the winding and cutting of thread of similar textile structures such as, filaments, ribbons, straws, slit films or the like composed of cellulose derivatives, regenerated cellulose, rubber, synthetic rubber, resins or similar substances.

It is an object of this invention to provide a method for the continuous collecting of threads or the like and continuously cutting the same during the collection thereof into substantially exact predetermined lengths.

It is another object of this invention to provide a method for continuously forming a cake of thread on a bobbin or the like and continuously and automatically cutting the thread of which said cake is composed into substantially exact predetermined lengths.

It is a further object of this invention to provide a method for continuously spinning an artificial thread, winding said thread into the form of a cake on a bobbin or the like, and continuously and automatically cutting the thread of which said cake is composed into substantially exact predetermined lengths.

It is a still further object of the invention to provide apparatus for carrying out the methods of the above said objects.

Other objects of the invention will appear hereinafter.

The objects of the invention may be accomplished, in general, by winding a thread onto a bobbin or the like to form a cake having a thickness of at least $1/64''$ and continuously and automatically cutting transversely through the wound threads of said cake.

The invention will be more clearly apparent by reference to the following detailed description taken in connection with the accompanying illustration and several embodiments thereof.

In the drawings:

Figure 1 is a vertical sectional view of a spinning, winding and cutting apparatus constructed in accordance with the present invention.

Figure 2 is a vertical cross-sectional view taken along the line 2—2 of Figure 1.

Figure 3 is a vertical cross-sectional view taken along the line 3—3 of Figure 1.

Figure 4 is a vertical sectional view of a modified form of spinning, winding and cutting apparatus.

Figure 5 is a vertical cross-sectional view taken along the line 5—5 of Figure 4.

Figure 6 is a vertical cross-sectional view taken along the line 6—6 of Figure 4.

Figure 7 is a vertical cross-sectional view taken along the line 7—7 of Figure 4.

Referring to the drawings, reference numeral 12 diagrammatically designates a cellulose acetate thread spinning machine. The thread 14 issuing from the spinning machine passes through traverse thread guide 16 which is reciprocated by means of traverse bar 18 which in turn is actuated by rotating grooved drum 20; the bar 18 being provided with a follower 22 which is positioned to travel in groove 24 of drum 20. The thread is then passed through opening 26 of staple cutting chamber 28. The top of chamber 28 is preferably hinged to the side-walls thereof for ready access to the interior of the chamber. Rotatably positioned within chamber 28 is a shaft 30 which is journaled outside the chamber 28 in bearings 32 and 34. Mounted on the shaft 30, within chamber 28, is a knife blade holder 36 which is fixed to the shaft by means of countersunk screw 38. A plurality of knife blades 40 are fixedly positioned in holder 36. A bobbin 42 is slidably mounted on shaft 30, the middle portion of which bobbin 42 surrounds the holder 36. The bobbin 42 is provided with a plurality of slots 44 through which the knife blades 40 may project. The bobbin 42 may be constructed of a plurality of detachable sections so that it may be mounted on the shaft so as to fit about blades 40. Bobbin 42 is connected to the shaft in such a manner that it will rotate therewith but will be slidable relative thereto. This may be achieved by means of a screw 46 positioned in bobbin 42 and cooperating groove 48 cut in shaft 30. Bobbin 42 is provided with an extension 50 which projects from chamber 28. Extension 50 contains an annular groove 52 in which are positioned oppositely directed lugs 54 of bifurcated lever 56. Lever 56 is pivotally mounted on a base at 58 and is provided intermediate the ends thereof with a finger 60. The projecting end of the finger is provided with a follower 62 which is adapted to follow the circular eccentric 64 of gear wheel 66. The shaft 30 is rotated by means of belt 68 and pulley 70. A second pulley 72 is mounted on

shaft 30. Pulley 12 is connected to pulley 74 mounted on shaft 76 by means of belt 78. Shaft 78 is adapted to rotate gear wheel 80 which in turn has a worm drive connection with gear 66. By this construction shaft 30 will be continuously rotated and bobbin 42 will be continuously rotated and reciprocated.

Chamber 28 is provided with a plurality of branch conduits 82 and 84 which converge at 86 to form the main conduit 88. Conduit 88 is preferably provided with a suction fan 90 which is adapted to draw the cut staple fiber from chamber 28 to any desired storage receptacle (not shown).

The thread traverse guide 16 is preferably provided with a comparatively short travel independent of the traverse of the bobbin. The traverse speed of the guide 16 should be sufficiently high so that the thread layers will be wound in such a fashion that they will cross and re-cross themselves a great number of times, and thereby hold each other in place during the cutting thereof. The traverse of the guide 16 is sufficiently short so that the thread 14 in its travel to the bobbin will not contact the knives 40 and thus become severed before it has been firmly wound on the bobbin. It is preferred that the ratio of the revolutionary speed of the bobbin to the traverse of said bobbin is such that the thread may build up to a cake having a thickness of $1/64''$ to $1/4''$. The traverse guide 16 is actuated at a different speed than the reciprocation of the bobbin to permit a short relatively rapid thread traverse which causes the thread to be looped on to itself and thereby prevent portions of the thread from flying outwardly before they are cut into precise staple lengths. In order to make the thread traverse guide easily adjustable relative to the bobbin rotating mechanism, it is preferred that the former is actuated independently of the said bobbin rotating mechanism. The fan 90 is preferably driven at such a speed that a slight vacuum is maintained in chamber 28 to draw the staple threads into the conduit 88 as soon as they are cut from the cake. The knife blades 40 are preferably positioned at such an angle that the thread cake is pressed from the outside towards the bobbin so that all thread layers are firmly supported by the slotted bobbin. In this manner, any externally positioned thread layer which is cut prematurely will not be caused to fly outwardly by the centrifugal force before it is cut into the predetermined staple length. The bobbin 42 preferably has a traverse stroke which is sufficiently long that the central circumferential portion thereof will be passed under all of the knives to prevent any permanent build-up of uncut thread on the bobbin.

Referring to the modified form of apparatus illustrated in Figures 4 to 7 of the drawings, the thread 14 issuing from spinning machine 12 passes through traverse guide 16 which is actuated in the same manner as that above described with reference to Figure 1. Obviously, the traverse mechanism may be of any desired construction. The thread 14 passes through opening 101 of chamber 103 to be wound on bobbin 105. Bobbin 105 is preferably detachably mounted on shaft 107 which is rotatably and reciprocally positioned in chamber 103. Two annular sleeves 109 are rotatably positioned within annular grooves 111 of the chamber 103. The sleeves 109 surround bobbin 105 and are keyed to longitudinal groove 113 of the bobbin so that they will rotate with the bobbin but slide longitudinally on the bobbin as

the latter is reciprocated. The sleeves 109 are provided at the internal peripheries thereof with knife blades 115 which project inwardly into grooves of the bobbin. The thread 14 is wound onto the bobbin 105 to form a thin cake. The thread of which the cake is composed is cut into staple lengths when the bobbin is reciprocated and the cake is passed into contact with knife blades 115. The shaft 107 is rotated by means of belt 117 and pulley 119. The pulley is connected to the shaft by means of inter-engaging projections 118 and grooves 120, (see Figure 6). In this manner the shaft may be rotated by the pulley 119 and still be capable of longitudinal sliding movement relative to the pulley. The shaft 107 is reciprocated by means of oscillating lever 121, which is connected to the shaft in the same manner as lever 56 is connected to shaft 30 in Figure 1. The lever 121 is oscillated by means of extension 123 and the cooperating eccentric cam 125 of gear wheel 127 in the same manner as the similar structure of Figure 1. Gear wheel 127 is driven by worm 129 positioned on stub shaft 131, which in turn is driven by the chain and sprocket drive 133 from pulley 119.

The thread 14 is rapidly traversed on rotating bobbins 105 while the bobbin is very slowly reciprocated. Upon reciprocation of the bobbin the thread cake is carried into contact with knife blades 115 which cut the thread into staple lengths. The chamber 103 is preferably connected with a conduit 140 through which the staple fibers may be drawn from the chamber by suction.

The thread which is passed through the continuous winding and staple cutting mechanism is preferably continuous filament thread which may be formed by a single spinning unit or by a series of units in which the several threads are suitably brought together prior to their winding and cutting. Alternatively the threads may be taken from a creel of bobbins or other textile packages to supply a more or less continuous feed of thread to the bobbin on which the thread is cut.

The thread, prior to conversion into staple, may be modified in any desirable manner. Thus, the thread may first be submitted to stretching beyond its elastic limit and thereafter cut into staple having an improved tenacity. The thread may, if desired, be formed from a spinning solution containing various substances such as pigments, plasticizers, dyes, resins, and the like. Again, the thread may be given an antistatic dressing prior, during, or subsequent to the cutting operation.

By the term "thread" as used throughout the specification and claims is meant any structure suitable for use in textile operation, such as filaments, threads, straws, tapes, slit films and ribbons.

By the use of the above described process and apparatus, yarn may be cut automatically and continuously while it is being spun and fed to the wind-up bobbins at a high speed of 100 to 500 or more yards per minute. In addition to the automatic and continuous handling of the yarn thread at high speed, the invention permits precise cutting of yarn into staple lengths which do not vary approximately more than $0.01''$ by reason of the fact that the circumference of the bobbin is relatively large and the yarn cake is relatively thin. The use of a rapidly moving short-stroke traverse guide permits the building of a cake in which the yarn is continuously looped back on itself and thereby pre-

vents the cake from unwinding when partially cut.

Since it is obvious that various changes and modifications may be made in the processes and apparatus above described without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited thereto except as set forth in the appended claims.

10 I claim:

1. The process of continuously forming a cake of artificial thread, and continuously and automatically cutting the thread from said cake into predetermined lengths.

15 2. The process of continuously forming a cake of artificial thread having a thickness of at least $1/64''$, and continuously and automatically cutting the thread from said cake into predetermined lengths.

20 3. The process of continuously winding a cake of artificial thread having a thickness of from $1/64''$ to $1/4''$, continuously and automatically traversing said cake into the path of a knife blade whereby to cut said thread from said cake into predetermined lengths.

25 4. The process of continuously winding a cake of artificial thread having a thickness of at least $1/64''$, continuously and automatically traversing said cake into the path of a plurality of knife blades whereby to cut said thread from said cake into predetermined lengths.

30 5. In an apparatus for the production of staple fiber, a bobbin, means for rotating and reciprocating said bobbin, means for guiding and traversing a thread onto a section of said bobbin to form thread cake thereon, and means for cutting said thread from said cake upon reciprocation of said bobbin.

6. In an apparatus for the production of staple fiber, a bobbin, means for rotating and reciprocating said bobbin, means for guiding and traversing a thread onto a section of said bobbin to form a thread cake thereon, and means rotatable with said bobbin for cutting said thread from said cake upon reciprocation of said bobbin. 5

7. In an apparatus for the production of staple fiber, a bobbin, means for rotating and reciprocating said bobbin, thread traversing and guiding means for progressively building a thread cake along said bobbin, said thread traversing and guiding means having a driving means independent of said bobbin rotating and reciprocating means, and means for cutting said thread from said cake upon reciprocation of said bobbin. 10 15

8. In an apparatus for the production of staple fiber, a bobbin, means for rotating and reciprocating said bobbin, thread traversing and guiding means for progressively building a thread cake along said bobbin, cutting means for severing said thread from said cake upon reciprocation of said bobbin, said cutting means positioned relative to said thread cake at such an angle as to press the latter against said bobbin. 20 25

9. In an apparatus for the production of staple fiber, a bobbin, means for rotating and reciprocating said bobbin, thread traversing and guiding means for progressively building a thread cake along said bobbin, said thread traversing and guiding means having a driving means independent of said bobbin rotating and reciprocating means, and means rotatable with said bobbin for cutting said thread from said cake upon reciprocation of said bobbin. 30 35

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