Aug. 27, 1957 T. M. DUNCAN 2,804,273

METHOD OF WINDING FILLING, CAM, AND COP PRODUCED THEREBY

Filed Feb. 9, 1956

FIG. 6

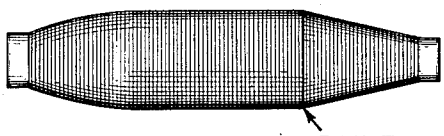


FIG. 1

FIG. 3

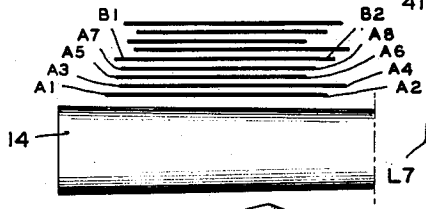


FIG. 2

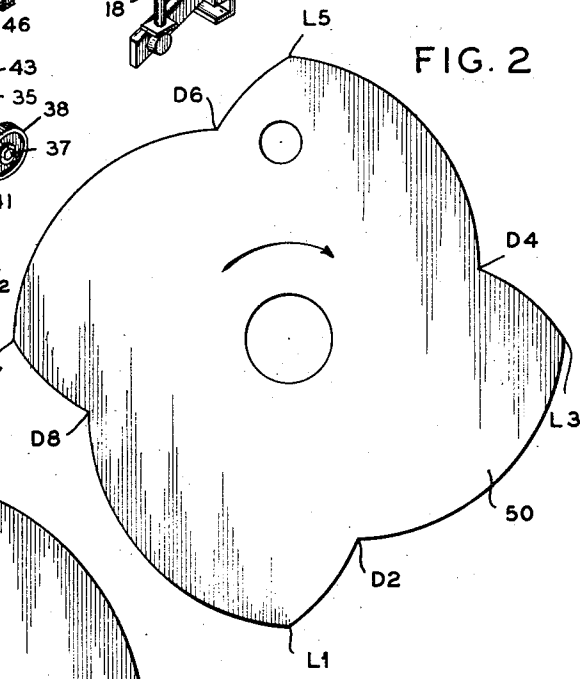
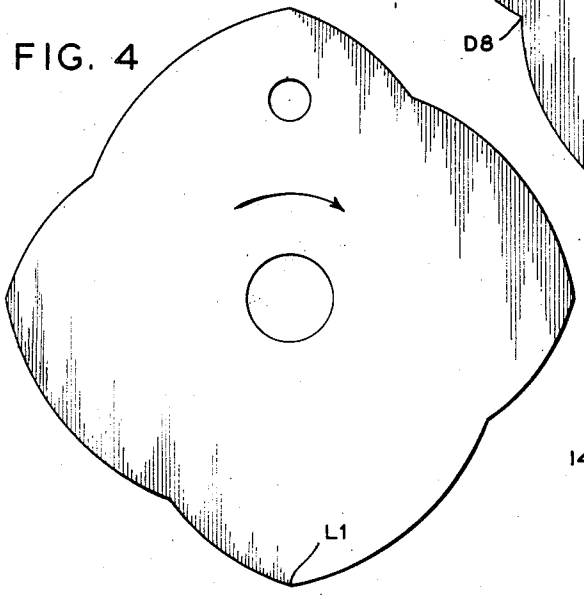
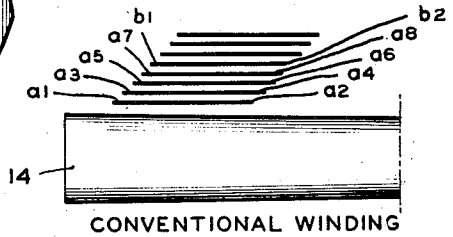


FIG. 4



CONVENTIONAL BUILDING CAM



CONVENTIONAL WINDING

FIG. 5

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METHOD OF WINDING FILLING, CAM, AND COP PRODUCED THEREBY

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4 Claims. (Cl. 242—26.45)

This invention relates to yarn winding and more particularly to the winding of filling yarn onto a bobbin in which the yarn is traversed in a reciprocating motion over a limited portion of the bobbin, the traverse motion gradually moving upwardly on the bobbin to produce a cop having a cylindrical central portion and tapered ends.

Apparatus for producing a filling wind of this general character has been used for many years and is well known to the art. Although various changes have been made in elements of the winding apparatus the basic mechanism that is currently used has been in use for in excess of fifty years. So also has been the basic pattern or process of winding the yarn onto the bobbin. Essentially this consists of beginning the winding at the lower end of the bobbin, winding a layer of yarn upwardly a predetermined distance, say around two inches, and then dropping back almost as far as the start. This reciprocation continues and at the same time a second motion, oftentimes referred to as "picking," slowly moves the reciprocating mechanism upwardly. The result is that the lowermost windings of each stroke of reciprocatory movement have been brought close to, but not quite as far as, the bottom of the previous stroke. Certain variations in the extent of the individual reciprocatory movements within the total traverse have been made, especially at the upper part of the stroke, but these have been principally for the purpose of smoothing out the winding.

In recent years, in an effort to increase production, the speed of unwinding the filling bobbins onto other bobbins to produce "cheeses" has been substantially increased. Also, the diameter and the length of the cop has been increased. It has been found, however, with cops wound in the conventional manner that higher speed winding off or the use of larger diameter cops frequently produces sloughing off or roping of the yarn being wound onto the cheese bobbin which results in costly breakbacks, excessive waste of yarn, and additional labor costs in addition to production loss. Production has therefore been limited in winding off by the limit on the speed at which the cops could be unwound without sloughing off.

In addition, sloughing off has occurred during unwinding as a result of rough handling of the cops causing displacement of the yarn, particularly in the region of the filling point at which control of yarn wound by methods heretofore known has been lost.

Accordingly, it is an object of the present invention to provide a process and apparatus for producing an improved filling wind on an improved cop which may be unwound at speeds far greater than those presently possible without likelihood of sloughing off and which will permit winding of cops of larger diameter than those previously possible without sloughing off during unwinding, and at a wide range of yarn sizes.

These and other objects of the invention will become apparent from the following description in conjunction with the accompanying drawings, wherein:

Fig. 1 is a fragmentary perspective illustrating the application of a builder cam in accordance with the present invention to a conventional builder mechanism;

Fig. 2, a layout of a builder cam constructed in accordance with the present invention;

Fig. 3, a diagram illustrating the relation of the yarn layers in a filling winding produced using the cam of the present invention;

Fig. 4, a layout of a conventional building cam;

Fig. 5, a diagram illustrating the relation of the groups of yarn layers produced on a builder mechanism using a conventional cam; and

Fig. 6, a side view of a yarn cop.

Briefly stated, the present invention includes the winding of yarn onto a bobbin by a process in which the lower strands at the bobbin of certain strokes are overlapped or tied down by a subsequent stroke rather than being left in loose condition in which they are susceptible to sloughing off. The invention contemplates the use of a four point builder cam, although it is not thus limited, in which one point is sufficiently longer than the other three to more than compensate for the height gained through picking so that on every fourth stroke the yarn is carried down lower than the immediately preceding three strokes, thus preventing its coming loose and providing better control.

The invention also includes the provision of a filling cam which has relatively sharp points and valleys so that the period of dwell at the upper and lower ends of the stroke will be reduced, thereby reducing bunching at the ends of the strokes and thus further reducing likelihood of uncontrolled windings. The cop produced by the present invention is shaped similarly to those produced heretofore. However, it may be unwound at speeds approximately 50% higher without likelihood of sloughing off. Furthermore, the cops may be of larger diameter and the stroke may be substantially less than on previous machines.

Referring to the drawings, the illustrated machine has a frame **10** with a fixed rail **11** on which spindles **12** are mounted for rotation by belts (not shown). Bobbins **14** are mounted on the spindles.

A ring rail **15** carries a plurality of rings **16**, one for each of the spindles **14**. Each of the rings **16** has a traveler **17** for guiding yarn onto the bobbin.

The ring rail is ordinarily of considerable length and has a number of lifter rods **18** connected thereto whose lower ends are attached to lever **19** which is mounted by shaft **20** in bracket **21**.

One end of the lever **19** has a weight **22** which tends to keep the ring rail in raised position.

An arm **25** fixed to shaft **20** has a chain or similar connecting member **26** attached thereto which runs over a sprocket **27** and is secured to a winding drum **29**. The winding drum is mounted adjacent to the end of a builder arm **31** which is pivotally mounted at **32** on a bracket (not shown) extending from the frame.

The winding drum **29** is connected to rotate with a worm wheel **35** which is engaged with a worm **36** carried by the builder arm **31**. Worm **36** runs on shaft **37** to which a ratchet or pick wheel **38** is connected. The wheel **38** has a pawl or a pick **40** engaged therewith which is pivotally mounted at **41** and is under the control of a pick rod **43** which reciprocates through bracket **44**, collars **45** and **46** being adjustably located on the pick rod to control the rotation of the winding drum **29**.

In order to produce movement of the ring rail a builder cam **50** (which will be described in detail later) is provided which is mounted on a shaft **51** which is rotated by suitable means, not shown.

The apparatus generally described operates in a well-known manner, namely: rotation of the builder cam **50**

produces oscillation of the arm **31** which by means of the chain **26**, arm **25**, lever **19** and rod **18** causes the ring rail **15** to reciprocate, the length of each stroke of reciprocation depending on the radii of the high and low points of the cam **50**. Superimposed upon the previously described reciprocatory motion is the intermittent upward movement of the ring rail which is produced by the picking mechanism. Briefly on each down stroke when the upper collar **45** on the pick rod reaches the limit of its downward motion the pick **40** produces limited rotation of the worm **36** which increases the effective length of the chain **26**, thereby permitting slight raising of the ring rail. On the upper strokes of the ring rail the pick rod **43** moves upwardly to the extent permitted by the collar **46** at which time the pawl moves past a few teeth on the wheel **35**.

The present invention includes a building cam **50** of novel configuration which may be used to produce an improved filling winding and thus an improved cop.

With particular reference to the drawings, the method of laying a filling winding in accordance with the present invention will now be compared with the method currently in use. According to the conventional method, see Fig. 5, the winding begins at *a*1, moves upwardly to the top of the stroke *a*2, downwardly to the bottom of the next stroke *a*3, then up to the completion of the stroke *a*4. This continues as indicated at *a*5, *a*6, *a*7, and *a*8, the low points *a*1, *a*3, *a*5 and *a*7 corresponding to the high points of a conventional four lobe cam and the high points *a*2, *a*4, *a*6, *a*8 corresponding to the low points of such conventional cams. The next low point (with the builder cam in starting position) may be designated *b*1 and the high point *b*2, the winding progressing upwardly.

In starting the operator starts the winding at point *a*1 at the lowest useable portion of the bobbin corresponding with a high point **1—1** on a conventional cam as illustrated in Fig. 4. It will be observed that at the bottom of the strokes, the windings, as indicated at *a*3, *a*5, *a*7, *b*1, come substantially as low, but not quite as low as the immediately preceding low point. The result is that in unwinding the bobbin the low points of the windings are exposed without being lapped by any subsequent windings; in being drawn off from the filling point at the top of the cop down the tapered slope thereof, especially at high speeds or when the cop diameter is relatively large, sloughing off of a number of the courses is likely to occur.

Referring now to the winding according to the present invention, the winding proceeding by reciprocating upwardly and downwardly with picking as heretofore, the upper and lower extremities are designated in Fig. 3 by the corresponding designations **A1**, **A2**, **A3**, **A4**, etc. It will be observed, however, that the low points **A3**, **A5**, and **A7** are substantially higher than the low point **A1** and that despite the continued upward movement of the reciprocating mechanism, which is caused by picking, the point **B1** drops below the lowermost ends of the preceding three strokes, thereby overlapping **A3**, **A5**, and **A7**. This overlapping ties down the yarn at the lowermost ends of the preceding three strokes and controls the winding off of the yarn so that faster winding off speeds are possible without the danger of sloughing off.

In starting the winding onto a bobbin in the event that the highest cam point is not in engagement with the follower on the builder arm it is necessary to start the winding slightly above the lowermost position on the bobbin which it is desired to wind in order that the subsequent lower stroke may not extend therebeyond.

Referring now to the cam for producing the novel winding, the cam has lobes with high points indicated as **L1**, **L3**, **L5**, and **L7**, intermediate of which are spaced depressions **D2**, **D4**, **D6** and **D8**. The cam layout is subject to variations, but essentially it includes the high points **L1—L7** and the low points **D2—D8** which cause the reciprocation of the ring rail, the angular distance from the lobes to the depressions being substantially less than that from the depressions to the lobes in order that the bulk of the winding will be deposited during the downward movement of the ring rail.

The cam of the present invention, however, otherwise is designed quite differently from conventional four lobe filling cams. Lobe **L1** in the illustrated embodiment is substantially longer (i. e.' of greater radius) than lobes **L3** and **L7** which may be of equal length, lobe **L5** being substantially intermediate lobes **L3** and **L7** and **L1** in radius. The lobe **L1** is sufficiently longer than lobes **L3**, **L5** and **L7** that despite the picking motion causing upward travel the yarn laid when the lobe **L1** produces maximum downward motion of the ring rail will overlap the lowermost courses laid on the preceding three strokes by lobes **L7**, **L5** and **L3**.

Intermediate the lobes the depression points **D2**, **D4**, **D6**, **D8** may be of variable radii; however, by making **D4** the shortest and progressively increasing in radius the points **D2**, **D8**, and **D6**, in that order provides excellent results. In addition, the configuration of the lobes and depressions illustrated produces quick changes in the direction of motion at the bottoms and tops of the strokes thus reducing the dwell and increasing the control achieved. Intermediate the high points and low points of the cam the configuration of the cam is such as to provide maximum efficiency and control in winding.

The radii of the lobes and depressions are proportioned to produce picking or intermittent upward movement of the ring rail of an amount and timing to achieve the desired result, the inter-relation between the picking motion and the reciprocatory movement being well known to those skilled in the art.

The illustrated cam, which produces excellent results, has the following radii at the designated points:

L1—6½″	D2—4 13/16″
L3—6⅜″	D4—4 11/16″
L5—6 7/16″	D6—5 1/16″
L7—6⅜″	D8—4 15/16″

Although the illustrated cam has certain dimensions as described, it will be understood that these are only illustrative of one form of the present invention and that the principle may be embodied in other cams. The improved cam, it will be understood, is characterized by having one lobe with a radius sufficiently greater than those of the remaining lobes that in the laying of filling winding the bottom of the stroke produced thereby will cause the yarn being laid to overlap or wind below the preceding strokes of the cam. Although the invention is illustrated in connection with a four lobe cam, it will be recognized that the principle is adaptable to cams having varying numbers of lobes.

Although the overlapping or tying down at the lower portion of the stroke is the principal characterizing feature of the improved cam design, the other characteristics of the cam such as the radii of the respective low points or depressions, the curvature, and the relatively sharp points and depressions providing fast changes in direction with relatively small amounts of dwell also provides important advantages.

Accordingly, it will be understood that the present invention includes an improved builder cam which produces a filling winding in which every fourth down stroke of the traveler lays yarn below the three immediately preceding strokes, the invention being applicable to cams having varying numbers of strokes, the cam also being designed to provide overlapping at the top of the strokes so that an eight point tie down or overlap, four at the top and four at the bottom, is produced. The resulting cop resists sloughing off including at the filling point and permits substantially higher winding off speeds than those previously possible.

The product produced in accordance with the present invention, namely an improved cop, is obviously adapted for use with any subsequent process requiring withdrawing of yarn from the bobbin, whether onto other bobbins.

looms, warp machines, winders, spoolers or others. The improved cam is adapted for the building of bobbins filled on spinning frames, twisters and quillers, or with any process of building a bobbin in which a building cam is used, and is applicable to various materials, including cotton, wool, silk and other fibers whether of natural or synthetic origin.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is illustrated in the drawing and described in the specification, but only as indicated in the appended claims.

I claim:

1. In the method of laying a filling winding in which yarn is traversed in a reciprocatory motion to and fro over a portion of a bobbin and in which the field of traverse is displaced slowly from the bottom to the top of the bobbin, the improvement comprising depositing the yarn in a repetitious series of four strokes, the lowermost winding of the second stroke being substantially higher than that of the first stroke, the lowermost winding of the third stroke being substantially lower than that of the second stroke but above that of the first stroke, the lowermost winding of the fourth stroke falling intermediate those of the second and third strokes, and the lowermost portion of the fifth stroke falling below those of the second, third and fourth strokes but above that of the first stroke.

2. The method of laying a filling winding in which the yarn is laid in reciprocatory strokes over a minor portion of the bobbin and in which the position of the strokes is gradually moved upwardly on the bobbin, comprising laying a series of strokes starting near the bottom of the bobbin and filling the bobbin by repetitiously repeating the laying of said series of strokes from the bottom to the top of the bobbin, the lowermost portion of the first stroke in the series being laid at a predetermined lowermost position, the subsequent strokes in the series having their lowermost portions higher on the bobbin than the lowermost portion of the initial stroke of the series, and laying the lowermost portion of the initial stroke of the immediately next succeeding series below the lowermost portions of the strokes of the immediately preceding series which are laid subsequently to the initial stroke of said immediately preceding series.

3. A yarn cop having a substantially cylindrical central portion and upper and lower tapered end portions in which the yarn is wound on the cop in conical layers whose length is substantially less than the length of the finished cop and in which the conical layers progress from the bottom to the top thereof in repetitious cycles having a plurality of layers per cycle, the improvement comprising the lowermost portion of one layer in each cycle being positioned below the lowermost portions of the immediately preceding winding layers in said cycle whereby said lowermost portions of said immediately preceding winding layers are overlapped in order to resist being sloughed off at the filling point of the cop.

4. In a mechanism for winding filling yarn onto a bobbin in which a ring rail guides the yarn onto the bobbin, and in which movement of the ring rail is governed by a cam having a plurality of lobes and depressions, the cam engaging a follower mechanism connected to the ring rail so that rotation of the cam causes a repetitious series of reciprocatory strokes of the ring rail, and in which the follower mechanism permits intermittent upward movement of the ring rail, the intermittent upward movement being superimposed upon the reciprocatory movement caused by the cam, the amount and timing of the intermittent upward movement being controlled by the radii of the lobes and depressions; the invention comprising the cam formed with a lobe longer than those immediately preceding and succeeding said lobe in the revolution of the cam so that said lobe produces a lower stroke than the immediately preceding and succeeding lobes, and formed with the depression immediately succeeding the lobe to cause said follower mechanism to impart increased upward movement of increased velocity to said ring rail sufficiently that the lowest winding of said immediately preceding and succeeding lobes is substantially higher than that of said lobe.

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