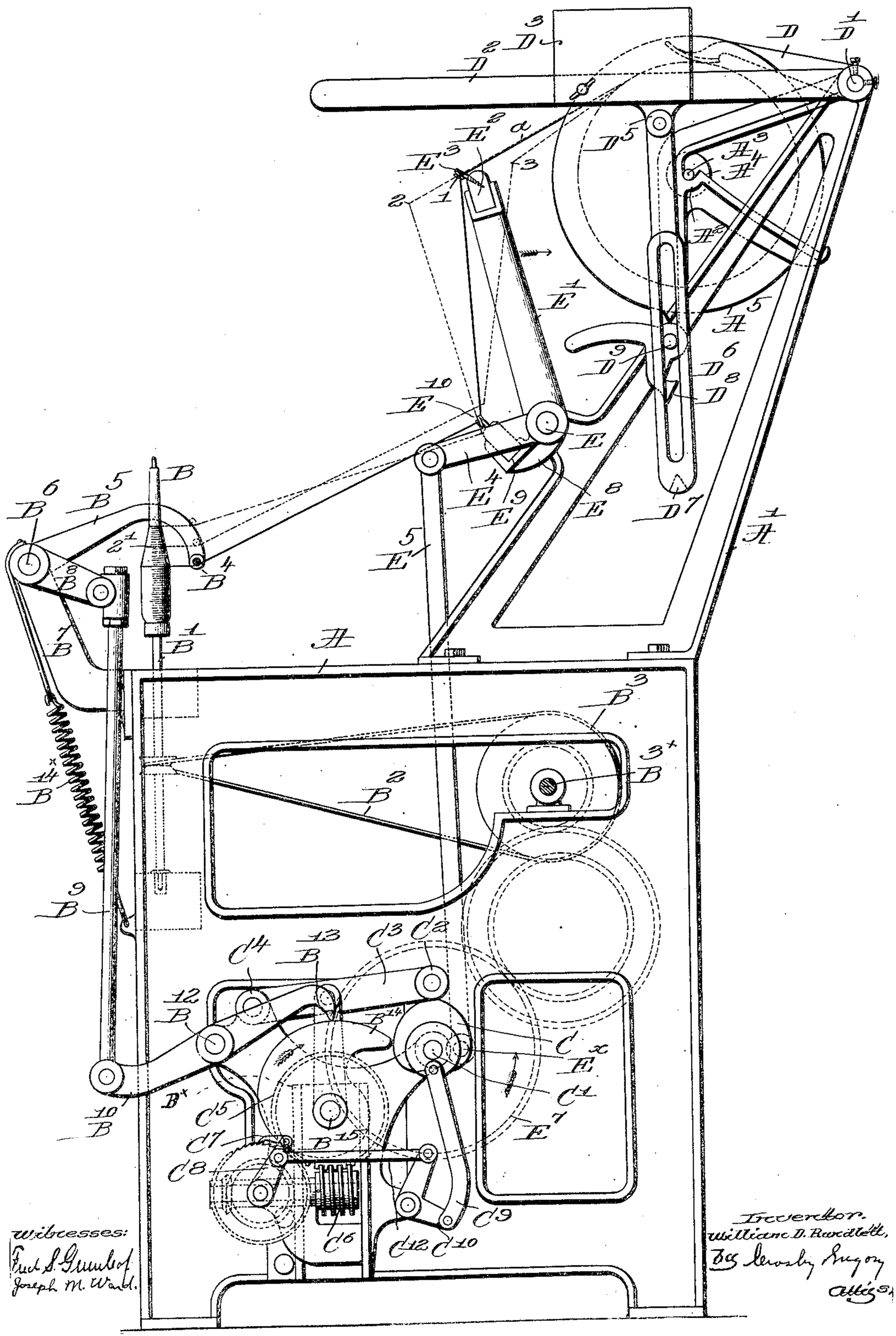
No. 879,798. PATENTED FEB. 18, 1908.

W. D. RUNDLETT.

BOBBIN WINDING MACHINE.

APPLICATION FILED AUG. 10, 1907.



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BOBBIN-WINDING MACHINE.

No. 879,798. Specification of Letters Patent. Patented Feb. 18, 1908.

Application filed August 10, 1907. Serial No. 388,033.

To all whom it may concern:

Be it known that I, WILLIAM D. RUNDLETT, a citizen of the United States, and resident of North Andover, county of Essex, State of Massachusetts, have invented an Improvement in Bobbin-Winding Machines, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

The machine to be herein described and constituting my invention is adapted to wind bobbins after the manner of the filling wind wherein the yarn is laid in conical layers, each coil of each conical layer being of different length. It is well understood that said conical layers must be wound smoothly and snugly one on the other at uniform tension in order that the yarn may unwind from the bobbin while in a shuttle without tangling.

In my invention the yarn to be wound on the bobbins is taken from a spool containing an indefinite number of yarns, and each yarn is attached to a bobbin carried by a separate spindle, said spindles being revolved at uniform speed.

It will be understood that when the spindles and bobbins are revolved at uniform speed and the yarn is laid thereon in conical coils varying in length circumferentially, that the yarn to be wound on the bobbins must be delivered to the bobbins in varying amounts at each revolution of the bobbin during the winding of a conical layer, and the amount of yarn delivered for each coil of the layer will correspond with the circumference of the bobbin or yarn load where each individual coil is being laid.

The strain on the yarns taken from a spool and led to the bobbins is depended upon to rotate the spool, and should the yarn be led directly from the spool to the bobbins and wound thereon in conical layers as stated, it is obvious that the strain on the yarn would be so varied as to rotate the spool at variable rates of speed so that the inertia of the spool due to its mass will cause great additional strain to be exerted on the yarn while said yarns are being wound from a smaller diameter on the bobbin to a larger diameter, and after the spool has reached its greatest velocity it delivers, due to its momentum, more than desirable when the yarn is wound on the bobbin from its largest to its smallest diameter.

Up to the present time no means have been devised to produce sufficient tension on a spool to control its momentum that will not prove destructive to the yarn at some point of its delivery.

In accordance with my invention I have combined with a series of spindles and bobbins rotated at uniform speed during winding of yarn thereon, and with a spool subjected to a uniform tension and moved by the yarn at a substantially uniform velocity, means for storing up yarn while the conical layer is being wound from its median line to its smaller end and back again to said median line, the yarn so stored up while winding substantially one-half of two conical layers being thereafter delivered to the bobbins while winding said conical layers from their median line to their larger ends and back again to said median line. In other words with relation to the spool the surface speed of the spool is equal to the surface speed of the bobbins when receiving the coil of yarn constituting the median line of each conical layer.

As I have herein chosen to illustrate and describe my invention I have mounted between the spindles and bobbins on one side and the spool supplying the yarn to the bobbins a movable device that will act to supplement the usual winding strain and store up yarn while the halves of two conical layers are being wound, and deliver said stored up yarn to the bobbins as the lower halves of two conical layers are being wound.

The drawing represents in end elevation a sufficient portion of a winding frame, with my invention applied thereto.

Referring to the drawing, A represents part of one end of a winding frame having a top structure A′ mounted thereon, said top structure having a bearing A^2 to receive a spindle or journal A^3 extended from the barrel A^4 of a spool having, if desired, usual heads A^5, and between which on said body is wound a series of yarns *a* to be in turn rewound therefrom onto a series of bobbins B to be described.

The bobbins B are carried by spindles B′ mounted in usual bearings and represented

as being driven by bands B^2 from any usual drum B^3, the drum being rotated at uniform speed and rotating the spindles in like manner.

The yarn is shown as being wound on the bobbin in conical layers, each coil of yarn surrounding the bobbin between the bottom and top of each layer varying in length.

That the yarn may be wound in conical layers, I have in the present instance of my invention adopted a faller wire B^4 carried by an arm B^5 connected with the shaft B^6, sustained in a suitable bearing B^7 attached to the frame, said shaft having an arm B^8 that is connected by a rod B^9 with a lever B^{10} having its fulcrum on a fixed stud B^{12}, the opposite end of said lever having a toe B^{13} that rests on a feed cam B^{14} carried by shaft B^{15} mounted in a slide $B^\times$ movable up and down together with the means for rotating the feed cam by means of a heart-cam C mounted on a shaft C′ having fixed bearings in the framework, said shaft being moved at uniform speed by a train of gears connecting it with the drum B^3, said heart-cam C acting on a roller C^2 carried by a lever C^3 having its fulcrum at C^4 and fixed in the framing of machine.

The shaft B^{15} carrying the feed cam B^{14} has a toothed wheel C^5 that is engaged by a worm C^6 deriving its motion step-by-step through a pawl C^7 mounted on a pawl-carrier C^8 deriving its movement from a link C^9 connected with the crank pin on a disk carried by the shaft C′, and an intermediate elbow lever C^{10} and link C^{12}.

The shaft C′ is rotated, taking with it the heart-cam C, and rotating the same once during the winding of two conical layers of yarn, one from the larger diameter to the smaller, and the other from the smaller to the larger diameter, and during this operation the lever C^3 is raised, taking with it the slide carrying the feed cam B^{14} and its operating mechanism, which, as stated, is rotated slowly, so that the toe B^{13} held in contact with said cam through the arm B^8 and rod B^9 by a spring $B^{14\times}$ may occupy, on the feed cam, a different position each time the faller wire B^2 reaches its lowest point, that is the faller wire at each successive descent is left a little higher than it was at the descent immediately preceding it, and the faller wire at each ascent goes up a little higher than it did at the ascent preceding. In this way the conical layers are carried up on the body of the bobbin in usual manner.

The means referred to for raising and lowering the faller wire as described constitute what is designated as a builder-motion, and instead of the particular builder-motion herein partially outlined, I may employ any other usual or suitable builder-motion that will move the faller up and down at the required speed and for the required distances.

To produce uniform resistance on the yarn surface of the spool, I have illustrated a pad carried at the end of an arm D connected with a shaft D′, said shaft having an extended arm D^2 on which is adjustably clamped a weight D^3, said weight causing the pad to bear on the surface of the yarn whatever its diameter.

To maintain the friction device, weight lever, and weight in their inoperative position when supplying a spool, I have jointed to the weight lever at D^5 a link D^6 having at its lower end a projection D^7 that when the link is lifted may engage a hook D^8 of a catch pivoted at D^9.

The upper structure A′ has suitable bearings to receive a shaft E having suitable upright arms E′ shaped at their upper ends to receive and hold a bar E^2 provided with a series of guide eyes E^3, one for each yarn led from the spool to the different bobbins. The shaft E is a rock-shaft, and it has an arm E^4 to which is jointed a rod E^5 represented as embracing at its lower end a crank pin $E^\times$ carried by a gear E^7 fast on the shaft C′ carrying the heart cam and driven from the drum-shaft $B^{3\times}$, so that said rock-shaft controlled by said crank has given to it a variable motion that moves the bar E^2 at different speeds during its stroke from one to its other extreme.

The rock-shaft E has suitable arms E^8 that sustain a second bar E^9 in turn provided with a series of yarn-guiding eyes E^{10}, the yarns led from the spool through the eyes E^3 being also led through the eyes E^{10} on their way to the bobbins, and the eyes E^{10} are so located with relation to the longitudinal axis of the shaft E that they produce in their movement little or no variation in the length of yarn extended between the eyes E^{10} and the bobbins.

The drawing in full lines shows the bar E^2 and thread-eyes E^3 in the position they will occupy when the yarn is laid upon the bobbin at the bottom of the conical coil, the yarn being about to be wound onto the larger end of the coil, and thence upwardly towards the median line of the coil.

It will be understood that the surface velocity of the spool is that requisite to provide yarn for the coil of the conical layer which is substantially midway the length of the layer, and that during the operation of winding each conical layer, thread must be drawn from the spool and so maintained by the bar E^2 and its connections, that when the winding is taking place from the median line 2′ of the yarn cone on the bobbin to its point of smallest diameter, and back again to the median line, the yarn must be taken up and retained by the bar E^2, and when winding from the median line of the yarn cone to its point of largest diameter and back again to the median line the yarn so taken

up must be delivered to the bobbin. In this way it is possible to control the delivery of yarn exactly to the requirements of the length of each particular coil constituting each conical layer, and at the same time deliver the yarn under the same tension, the yarn being drawn from the spool by the combined action of bar E^3 and bobbin strain at a uniform rate corresponding with the requirements of the median coil.

Viewing the drawing, it will be supposed that the series of guide-eyes E^3 stood at the position 2, dotted lines, when the faller wire B^4 stood in the dotted or median line position 2′, and while winding from the median line 2′ down to the position shown by full lines in the drawing where the yarn cone is of greatest diameter, the bar E^2 was moved in the direction of the arrow into its full line position, and during such movement it gave up the thread, which was supported by it, to the increasing length of coils, and this delivery must continue until the yarn is led up the next layer to the median line, and consequently the bar E^2 will complete its back stroke into the position 3, shown by dotted lines, as the faller wire B^4 rises from its lowest position shown by full lines to the median line position 2′. Now when winding from the median line position 2′ upwardly along the yarn cone to the smallest diameter, the bar E^2 will be started from the position 3 and moved gradually to the left, it arriving in its full line position substantially as the yarn reaches the upper end of the conical layer, thus taking up and pulling additional yarn from the spool and keeping the spool velocity constant, said additional yarn not being required in this part of the wind, and while the wind is reversed from the top or smaller layer to its median line, the bar E^2 is moved from its full line position into the position 2.

It may be explained that all portions of the yarn cone lying above the median line 2′ are of smaller diameter than the average or median diameter 2′ so that the take-up bar E^2 must supplement the action of the bobbin in drawing yarn from the spool both on the upward and downward movement of the winding wire, and the reverse is true of that part of the cone lying below the average or median line 2′ during the winding of which both in the upward as well as the downward movement of the wire, the yarn stored by the take up must be delivered.

The pull on the yarn to move the spool is due chiefly to the rotation of the bobbins and spindles augmented by the movement of the bar E^2, the two coacting in such manner as to maintain substantially the same length of yarn between the thread eyes E^3 and the bobbin, the length of thread, however, varying between the bar E^2 and the spool.

I believe that I am the first to combine with a spool carrying one or more yarns and one or more spindles moved at a uniform velocity and carrying conical ended bobbins, of any means whatever for taking up and delivering the yarn at intervals between the spool and bobbins as the length of coils in the conical layers demand during the winding operation, and I desire to claim this feature broadly irrespective of the particular construction of the means for varying the length of yarn between the spool and bobbin at intervals during the formation of each conical layer, as for instance substantially the same effect might be accomplished by moving the spool toward and away from the longitudinal axis of the bobbin during the winding of each conical layer, but this construction would require more complex mechanism to control it than the particular means herein described. And so also it would be understood that the same result might be accomplished by moving the spindles and their bearings to and fro which would necessitate a more complex structure, one suitable to move the spindles and the driving mechanism with it.

Having described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a winding machine, a spindle to carry a bobbin, means to rotate the spindle at a uniform speed, a yarn carrying spool moved at substantially uniform surface velocity by the yarn being wound, and means to increase and then diminish the length of yarn extended from the spool to the bobbin as demanded by the varying diameter of the yarn load being wound on the bobbin.

2. In a winding machine, a spindle to carry a bobbin, means to rotate the spindle at a uniform speed, a yarn carrying spool, a constant tension device for said spool, said spool being rotated at a substantially uniform surface velocity by the yarn being wound, and means to increase and then diminish the length of yarn extended from the spool to the bobbin as demanded by the varying diameter of the yarn load being wound on the bobbin.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM D. RUNDLETT.

Witnesses:
GEO. W. GREGORY,
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