No. 795,982. PATENTED AUG. 1, 1905.

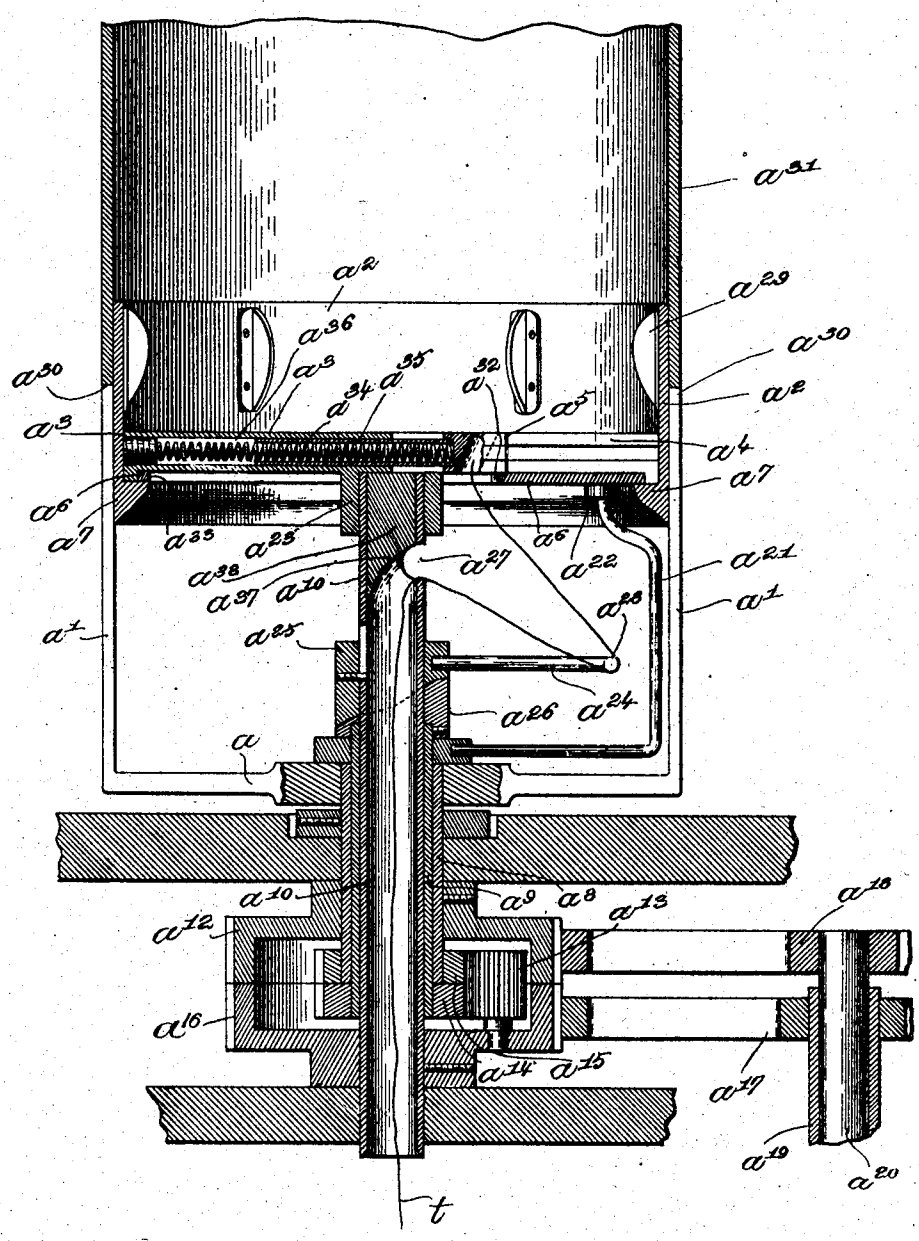
C. W. HUBBARD.

WINDING APPARATUS.

APPLICATION FILED JAN. 30, 1904.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
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2 SHEETS—SHEET 2.

Fig. 2.

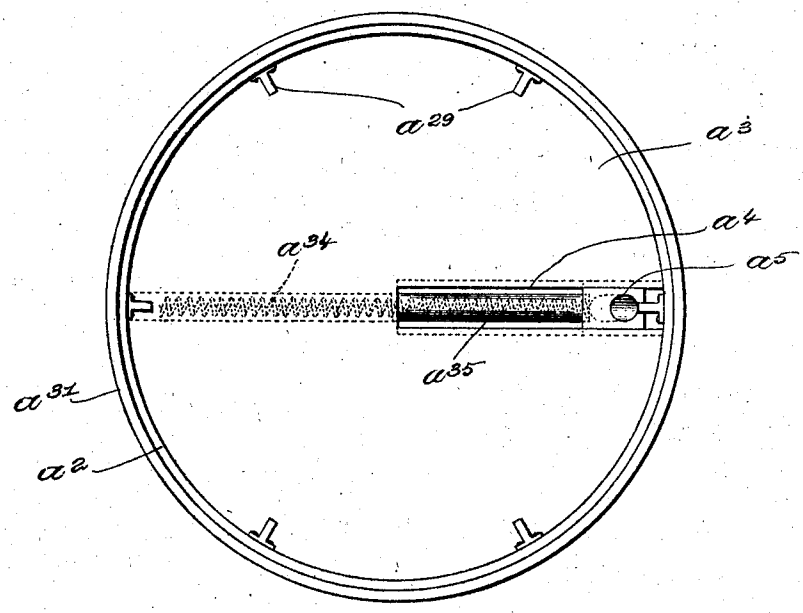
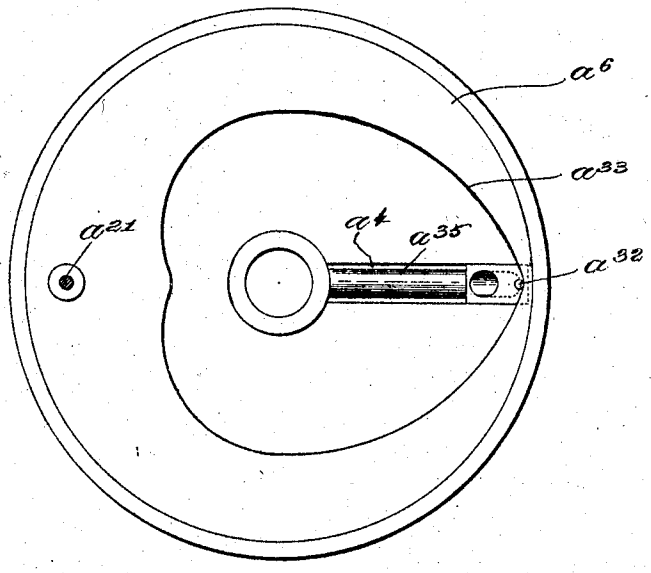


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES W. HUBBARD, OF BOSTON, MASSACHUSETTS.

WINDING APPARATUS.

No. 795,982. Specification of Letters Patent. Patented Aug. 1, 1905.

Application filed January 30, 1904. Serial No. 191,277.

To all whom it may concern:

Be it known that I, CHARLES W. HUBBARD, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Winding Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My present invention is an improvement on the general form of apparatus shown and described in my application, Serial No. 163,483, filed June 29, 1903, the improvements relating more particularly to means for simplifying the apparatus so as to wind or lay the thread or yarn with an even tension and also facilitate the convenience and speed of operation.

In building the thread mass by laying successive loops in the general arrangement as set forth more in detail in my aforesaid application it is obvious that if the thread is delivered with constant speed to a uniformly-moving thread mass or winding apparatus the thread will be under greater tension when being laid adjacent the periphery of the thread mass than when being laid adjacent the center, as greater travel takes place at the periphery than at the center, and hence if no provision is made for either changing the relative speed of movement or the speed of delivery as the winding approaches or recedes from the center of the thread mass there will be undue tension on the thread at the periphery and undue slackness at the center, thereby producing defective results, especially in the twisting, and accordingly I have devised means for avoiding the above objections and securing uniform tension at all times, and in connection therewith I provide means for avoiding the necessity of weighting the thread mass in order to secure properly compact and regular winding, and also means permitting the quick threading and starting of a new thread in the apparatus upon the breaking or completion of winding of the previous thread. These and further features of the invention and various advantages thereof will be pointed out in the course of the following description, reference being had to the accompanying drawings, in which I have shown a preferred embodiment thereof, the invention being further defined in the appended claims, also forming a part of this specification.

Figure 1 is a central vertical sectional view of a sufficient portion of the apparatus to make the invention clearly understood. Fig. 2 is a top plan view thereof, the thread-guide being in its outward position. Fig. 3 is a bottom plan view of the thread laying or winding members removed from the rest of the apparatus.

For enabling my invention to be fully understood I have shown the same as adapted both to wind and spin and for this purpose have shown means for producing the three relative movements necessary for accomplishing both of these results—viz., means for rotating the thread mass, means for rotating the winding member with relation thereto, and means for moving a path-controller with relation to said winding member, and it will be understood that the relative movements of these parts may be varied according to the degree of twist or the compactness of the thread mass and order of laying of the loops desired in any given case. While the general results may be accomplished simply by a relative movement, it is preferable that each part shall have a positive movement of its own.

The means for rotating the thread mass comprises a rotator in the shape of a flier a, whose arms a' carry at their upper ends a circular flange or housing a^2, constituting a thread-mass support for retaining and starting the thread mass, and the means for building up or depositing and laying the thread comprises a winding member in the form of a disk a^3, having a radial slot a^4, in which travels a thread-guide a^5, said thread-guide having lateral ribs which are received in grooves in the walls of the slot a^4. Beneath this plate or winding member is a path-controller or cam-plate a^6, having a heart-shaped cam for laying the thread in the proper form of loops for compact winding, said winding means a^3 a^6 being held in proper position for relatively rotating on the ledge a^7, projecting from the lower inner edge of the rotator-flange a^2. These several parts are respectively rotated by hollow shafts a^8 a^9 a^{10}, journaled in the frame, the shaft a^{10} being rotated by a gear a^{16}, which has mounted thereon, so as to turn about its own axis, a pinion a^{13}. This pinion is mounted eccentrically to the axis of the gear a^{16}, as plainly seen in Fig. 1, and is capable of rotation about its own axis independently of the rotation of the gear a^{16}. Said gear a^{13} meshes with two gears a^{14} and a^{15} on the shafts a^9 and a^8, respectively, said gears a^{14} and a^{15} having a different number of teeth.

The shaft a^8 has fast thereto and is driven

by a gear a^{12}. The gears a^{12} and a^{16} may be of the same or of different sizes and may be rotated at different relative speeds by any suitable means, as, for example, by means of gears a^{17} a^{18}, fast on shafts a^{19} a^{20}, respectively, which shafts are driven by any suitable driving mechanism. (Not shown.) The shaft a^8 carries at its upper end a rotator or flier a. The shaft a^9 carries at its upper end an arm a^{21}, engaging the path-controller a^6 at a^{22}, and the shaft a^{10} engages the winding member a^3 at a^{23}. The gears a^{12} and a^{16} are preferably rotated in the same direction, but at different speeds, and in such case the winding member a^3 and the flier or rotator a will rotate in the same direction, but at different speeds.

Since the gear a^{16}, which carries the pinion a^{13}, is rotating at a different speed from the gear a^{12} and since the gear a^{15} rotates with the gear a^{12}, it will follow that the gear a^{13} will be turned about its axis during its movement around the axis of the gear a^{16}, and as the gears a^{14} and a^{15} have a different number of teeth the shaft a^9 will gradually either fall behind or advance ahead of the shaft a^8, such movement being just sufficient to give the necessary increment or decrement to the successive loops of threads.

The means for providing uniform tension of thread-delivery, already alluded to, may be provided in various ways; but for compactness and simplicity of arrangement, as well as to permit the thread-delivery to take place at the bottom of the thread mass, I have arranged an arm a^{24}, projecting from a hub a^{25}, mounted to slide longitudinally on the shaft a^{10} and caused to rise and fall in unison with the movement of the path-controller a^6 by means of a cam a^{26}, fast on the upper end of the path-controller shaft a^9.

Since the shafts a^9 and a^{10} have a different speed relative to each other, it will be obvious that the hub a^{25} will be gradually raised by the cam a^{26} until the limit of its upward movement is reached, and then said hub will descend by its own weight, thus giving an up-and-down movement to the arm a^{24}. This up-and-down movement corresponds exactly with the in-and-out movement of the thread-guide, and thus the thread is maintained under an even tension.

The thread t passes up through the hollow shaft a^{10} and out through an opening a^{27} therein, thence under the free end of the arm a^{24}, as indicated at a^{28}, to the thread-guide a^5, by which it is laid on the under side of the thread mass, the latter being caused thereby to gradually rise as the thread mass builds up.

In order to cause the thread mass to turn with the rotator, suitable friction devices are provided, being herein shown as curved fins or inwardly-projecting wings a^{29}, secured to the inner wall of the housing a^2. A shoulder a^{30} is provided for receiving an inclosing can a^{31}, if desired, for directing and receiving the upwardly-moving thread mass.

By having the thread delivered at the under side of the thread mass and providing the frictional devices and the various constructional details explained I am enabled to wind a compact cylindrical thread mass without superimposed weights or other retaining and compressing devices. For further facilitating this object, as well as securing other advantages, I have provided the following means for yieldingly retaining the thread-guide a^5 in position. As herein illustrated, said thread-guide has a stud or depending lip a^{32}, which is adapted to engage the edge of the heart-shaped opening a^{33} of the path-controller a^6, and said stud is maintained in engagement with the edge of said heart-shaped opening by a spring a^{34}, which occupies a groove a^{36} in the winding member a^3 and abuts at one end against one end of said groove and at the other end engages the thread-guide a^5. For retaining the spring in position I provide a tube a^{35}, which is secured to the thread-guide and receives one end of said spring, as best shown in Fig. 1. By reason of this construction a new thread or broken thread may instantly be started on the under side of the thread mass, all that the operator is required to do being simply to shove the thread-guide back to the center and then insert the thread end upwardly through the thread-opening in said guide and then let go of the thread-guide, whereupon the upwardly-projecting end of the thread will be instantly caught and held frictionally between the bottom of the thread mass and the top of the winding member a^3.

Besides permitting the threading of the machine at the bottom of the thread mass the spring arrangement above explained permits a simple cam-plate or path-controller a^6, and also avoids the friction and possible catching, &c., of the thread-guide as constructed in my before-mentioned copending applications. In order to further facilitate the threading of the apparatus, the hollow shaft a^{10} is provided with a directing-surface a^{37} at its upper end for directing the thread end outwardly through the opening a^{27}, said surface being herein shown as provided at the lower end of a plug a^{38}, closing the upper end of the shaft.

In practice the thread mass is permitted to build up to a considerable length and is then separated into such sizes of thread mass as desired simply by inserting a suitable flat knife, so as to pry off or sever the upper portion of the thread mass from the lower portion, and the winding then continues, constantly pushing up the superimposed portion of the thread mass. The resistance of the curved wings a^{29} takes the place of a weight and effects a firm compact winding, while at the same time it compels the thread mass to rotate properly.

The speed of winding depends upon the relative rotation between the winding member or plate a^3 and the thread mass, and the amount of twist depends upon the number of revolutions of the winding member during the winding of a given length of thread, so that in order to increase the amount of twist it is necessary to bring the speeds of rotation of the winding member and the thread mass more nearly in unison, there being nothing but twist and no winding when both rotate together and the least twist when the winding member approaches a stationary condition.

The thread mass and winding member rotate with an unvarying difference in speed—that is to say, although the speed of operation of the machine may be varied to suit different kinds of work the speed of the winding member relative to the thread mass is maintained at a constant ratio for any given work.

As the thread-guide is reciprocated back and forth by the heart-shaped cam for laying the successive loops, the tension-evener rises and falls, permitting the thread to be delivered faster to the thread mass as the thread-guide moves outward and slower as the thread-guide moves inward, it being understood that the thread is required to pass with uniform speed along the hollow shaft a^{10}, (or such other means as may be provided for conveying or delivering the thread,) the movement between that point and the thread mass varying as the speed of the thread consumption varies, so that the thread will escape from said hollow shaft with the same speed irrespective of whether it is being laid near the center or near the circumference of the thread, and in order to have the winding means and thread mass rotate constantly with the same relative speed I have interposed the slackening and tightening device which takes up the thread as it is being deposited toward the center and gives out or releases the thread as the latter is being deposited toward the circumference.

If the thread breaks, the operator simply takes hold of the under side of the thread-guide and pushes the same inwardly to the center beneath the hollow center of the thread mass, being thereby enabled to insert the thread quickly up through the hole in the thread-guide, and upon releasing the latter the projecting upper end of the thread is immediately caught and held between the thread mass and plate or winding member a^3 while the winding continues.

If the thread escapes from the delivery-shaft a^{10}, it is readily inserted because of the directing shoulder or surface a^{37}.

By reason of the epicyclic gearing and variable driving thereof all the desired changes in relative motions above mentioned may be readily secured.

I am aware that the main features of my invention are capable of various embodiments, all within the spirit and scope of my invention, and accordingly it will be observed that certain of my claims are broad, while others of the claims are intended to cover the more specific details of the preferred embodiment of my invention, which I have herein shown and set forth in detail.

Certain of the features herein shown but not claimed are duly claimed in my aforesaid copending application.

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

1. In a machine of the kind described, a winding member for winding a thread mass in layers extending transversely of the axis of said thread mass, means for rotating said thread mass and said winding member at an unvarying difference in speed, and means for maintaining the same tension of thread delivery at all points in the laying of the thread.

2. In a machine of the kind described, winding mechanism including means for delivering a continuous thread for building up a thread mass, means for traversing said delivery means transversely of the axis of the thread mass, means for rotating the thread mass at a constant speed, and means for maintaining said thread under an even tension as it is delivered to said thread mass.

3. In a machine of the kind described, winding mechanism for winding a thread mass in layers extending transversely of the axis of the thread mass, including means for depositing the thread in loops, and means for varying the feed of said thread for different portions of the loops for maintaining a uniform tension.

4. In a machine of the kind described, a winding member for winding a thread mass in layers extending transversely of the axis of the thread mass, mechanism for rotating said thread mass and said winding member, including means for maintaining the speed of said winding member relative to the speed of said thread mass at a constant ratio irrespective of the variations in speed thereof, and means for maintaining the thread delivery at a uniform tension.

5. In a machine of the kind described, means for delivering the thread to be wound, a winding member for winding the thread in layers composed of loops extending toward the center, mechanism for rotating said winding member and said thread mass with a constant difference of speed, and means coöperating with said winding member for bringing a constant and uniform pull on said thread.

6. In a machine of the kind described, means for delivering thread to be wound, a winding member for winding the thread in layers composed of loops extending toward the center, and means coöperating with said winding member for bringing a constant and uniform

pull on said thread, said means consisting of a tension-evener movable toward and from said winding member.

7. In a machine of the kind described, means for winding thread in layers extending across the end of the thread mass, and tension-evening means for delivering the thread with a uniform tension irrespective of the speed of winding movement thereof.

8. In a machine of the kind described, a winding member, for winding thread on the bottom end of a thread mass, means for relatively rotating said thread mass and winding member, a thread-guide, means for traversing said thread-guide across the end of said thread mass, and means for maintaining the thread delivery at a uniform tension.

9. In a machine of the kind described, a winding member, for winding thread on the bottom end of a thread mass, means for relatively rotating said thread mass and winding member, a thread-guide, means for traversing said thread-guide across the end of said thread mass, a hollow shaft through which the thread is delivered, and means for varying the speed of delivery from said shaft to said thread mass.

10. In a machine of the kind described, a winding member for laying thread in loops across one end of a thread mass, mechanism for relatively rotating said thread mass and winding member, including a hollow shaft through which the thread is delivered to said winding member; a tension-arm engaging said thread, and means for moving said arm for varying the speed of thread delivery to said thread mass and securing a uniform tension.

11. In a machine of the kind described, means for supporting a thread mass, a thread-guide, and means for traversing the same across one end of the thread mass, actuating mechanism for relatively rotating said thread mass and thread-guide, including a hollow shaft through which the thread is delivered to said thread-guide, a tension-arm engaging said thread, and means for moving said arm to retard the delivery of thread as the thread-guide is moving toward the center and to permit a freer thread delivery as the thread-guide is moving away from the center.

12. In a machine of the kind described, supporting means for engaging and rotating a thread mass, a winding member beneath the thread mass for laying the thread across the lower end thereof, and a hollow shaft for delivering thread to said winding member.

13. In a machine of the kind described, supporting means for engaging and rotating the thread mass, a winding member for laying the thread across the lower end of said thread mass, a hollow shaft provided with a lateral opening for delivering thread to said winding member, and a deflecting shoulder or surface in said shaft for deflecting the thread through said opening.

14. In a machine of the kind described, supporting means for a thread mass, means for laying the thread in layers extending transversely of the bottom end of said thread mass, operating mechanism therefor, and means for feeding the thread from below.

15. In a machine of the kind described, supporting means for a thread mass, means for laying the thread in layers extending transversely of the bottom end of said thread mass, operating mechanism therefor, and means for feeding the thread from below, including a hollow shaft extending concentrically of said operating mechanism.

16. In a machine of the kind described, supporting means for a thread mass, means including a transversely-moving thread-guide for laying the thread in layers extending transversely of the bottom end of said thread mass, operating mechanism therefor, and means for feeding the thread from below, said thread-guide being movable out of winding position for being threaded whenever required.

17. In a machine of the kind described, a thread-guide for laying thread in loops extending transversely of one end of a thread mass, a path-controller for determining the traverse of said thread-guide, yielding means for normally holding said thread-guide under the control of said path-controller, said thread-guide being movable at will out of winding position permitting the same to be threaded.

18. In a machine of the kind described, a winding member for engaging the lower end of a thread mass, including a thread-guide, means for traversing said thread-guide across the end of said thread mass, actuating mechanism for relatively rotating said winding member and said traversing means, said mechanism comprising concentrically-arranged shafts and gearing extending below the before-mentioned parts.

19. In a machine of the kind described, a winding member for engaging the lower end of a thread mass, including a thread-guide for laying the thread across said lower end, and friction means for retarding the upward movement of said thread mass, and cause compact winding.

20. In a machine of the kind described, a winding member for engaging the lower end of a thread mass, including a thread-guide for laying the thread across said lower end, and friction means having an inwardly-curved surface for crowding against the thread mass and retarding the upward movement thereof.

21. In a machine of the kind described, a rotator for supporting and rotating a thread mass, and means for laying the thread in transverse loops across the lower end of said thread mass, said rotator being provided with friction-surfaces for engaging the thread mass while permitting the latter yieldingly to rise as the thread mass builds up.

22. In a machine of the kind described, means for laying the thread across the bottom

end of a thread mass, and means for holding the thread mass yieldingly down upon said means.

23. In a machine of the kind described, a rotator, a winding member, a path-controller, and means for operating the same, including concentric shafts for each of the aforesaid parts, and gearing connected with said several shafts for rotating the same at different relative speeds.

24. In a machine of the kind described, means for laying the thread in transverse layers across one end of the thread mass, including relatively rotating members adjacent the periphery of the thread mass, and means for preventing the thread from getting caught or dragged between said relatively rotating members.

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

CHARLES W. HUBBARD.

Witnesses:
GEO. H. MAXWELL,
J. ETHEL TARR.