

G. B. WARNER.
 MANDREL FOR PAPER WINDING MACHINES.
 APPLICATION FILED AUG. 21, 1911.

1,067,564.

Patented July 15, 1913.

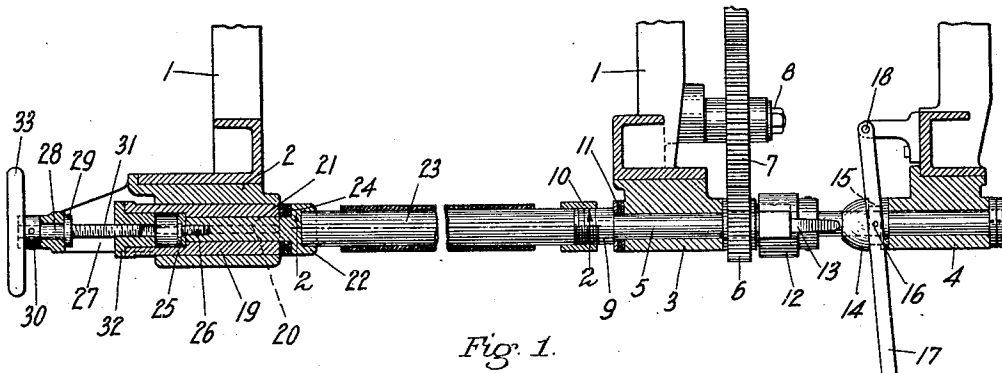


Fig. 1.

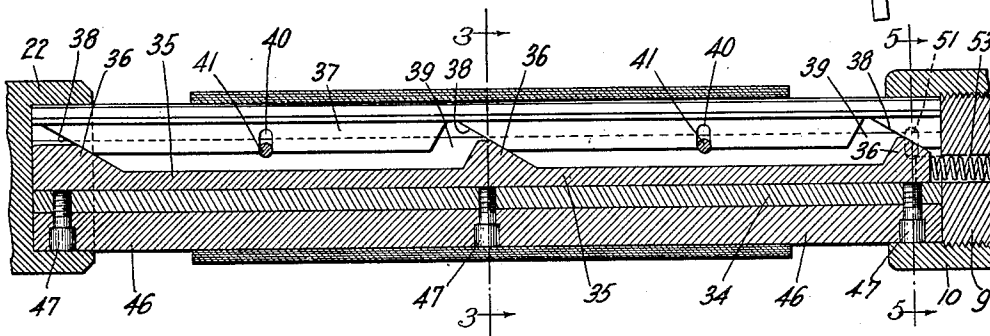


Fig. 2.

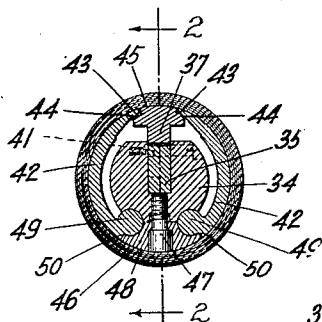


Fig. 3.

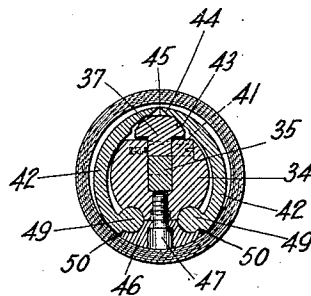


Fig. 4.

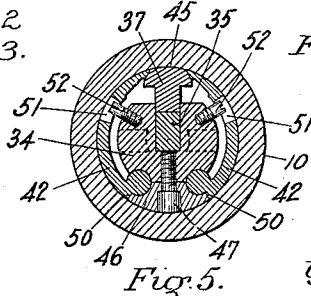


Fig. 5.

Witnesses:
 Edward H. Palmer
 Lloyd L. Luby.

Inventor:
 George B. Warner
 by Robt. P. Harris,
 Att'y.

UNITED STATES PATENT OFFICE

GEORGE B. WARNER, OF FITCHBURG, MASSACHUSETTS, ASSIGNOR TO P. T. JACKSON, JR., OF BOSTON, MASSACHUSETTS.

MANDREL FOR PAPER-WINDING MACHINES.

1,067,564.

Specification of Letters Patent.

Patented July 15, 1913.

Application filed August 21, 1911. Serial No. 645,281.

To all whom it may concern:

Be it known that I, GEORGE B. WARNER, a citizen of the United States, residing at Fitchburg, in the county of Worcester and State of Massachusetts, have invented an Improvement in Mandrels for Paper-Winding Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

The invention to be hereinafter described relates to mandrels for paper winding machines and more especially to such mandrels whereon the paper is wound in the formation of paper tubes or paper barrels. In the formation of such tubes and barrels it is desirable that the layers of paper be supplied with an adhesive, at least on one surface, and that the layers be wound with sufficient tension to produce a uniform and homogeneous product. On the one hand it is desirable that the mandrel have its winding surface substantially continuous and without depressions particularly in the direction longitudinally thereof; while, on the other hand it is desirable that the paper tube or barrel be readily removable from the mandrel at the completion of the winding operation.

With these general considerations in view the aims and purposes of the present invention are to provide a mandrel whereon paper may be uniformly wound to produce the desired homogeneous product, and wherefrom the paper tube or barrel may be conveniently and readily removed.

In connection with such a mandrel the invention further aims to provide means for expanding, rotating and subsequently permitting contractibility of the mandrel, all as will hereinafter more fully appear in connection with the accompanying drawings showing one convenient form of the invention for carrying it into practical effect, it being understood that in its true scope the invention is definitely pointed out by the claims.

In the drawings: Figure 1 is a sectional view, with some of the parts shown in elevation, of one convenient form of the invention including the mandrel and its expanding and rotating means; Fig. 2 is an enlarged longitudinal section on the line 2, 2 of Fig. 1; Fig. 3 is a section on the line

3, 3 of Fig. 2, said Fig. 3 showing the mandrel in expanded condition; Fig. 4 is a view similar to Fig. 3, showing the mandrel in collapsed condition; and Fig. 5 is a section on the line 5, 5 of Fig. 2.

The machine frame 1 having bearings 2, 3 and 4 for support of some of the operating parts may be of any usual or desired character.

Mounted in the bearings 3 and 4 is a shaft 5 having loosely mounted thereon, the pinion or gear 6 which meshes with a gear 7 deriving rotative movement from any usual source of power, said gear 7 being mounted on the stud shaft 8, Fig. 1. The shaft 5 at its inner end, the left in Fig. 1, has a head 9 on which is mounted a cap piece 10 movable longitudinally of the head 9 in any convenient manner, as by the thread connection indicated in Fig. 1, although it will be understood that this same character of movement for the cap piece 10 may be otherwise produced. Interposed between the end of the head 9 and the bearing 3 of the machine frame are suitable roller bearings 11 which sustain the thrust upon the head 9, as will hereinafter more fully appear.

Any suitable means may be provided for imparting rotative movement to the shaft 5 through the gear 6 and its operating connections, and as one convenient form of connecting the gear 6 operatively with the shaft 4 there is provided a clutch. This clutch may be of any usual or desired character, but herein it is shown as composed of the collar 12 fixed to the shaft 5 and carrying the gripping bars 13, the ends whereof are adapted to bind upon the hub of the pulley 6, all as will be well understood. In order to expand the clutch members 13 there is loosely mounted on the shaft 5 a cone 14 having a groove 15 into which extends suitable shoes 16 connected to the operating lever 17, which is itself pivoted to the machine frame at 18.

From the construction described it will be apparent that upon movement of the lever 17 to the left, Fig. 1, the clutch members 13 will grip the hub of the pinion 6 and cause said pinion to thereby drive the shaft 5. Mounted in the bearing 2, at the left, Fig. 1, is a plunger 19, free to slide longitudinally in the bearing 2, but keyed thereto, as indicated by the dotted lines 20, to be non-rotative. Extending axially through

the plunger 19 is a stem 21 having a head 22 provided with a suitable cavity to receive one end of the mandrel 23, suitable ball bearings 24 being interposed between the head 22 and the inner or right hand end of the plunger 19, as indicated in Fig. 1. The stem 21 is rotatably held in the plunger 19 by suitable means, as for instance, cap piece 25 which may be held to the end of the stem 21 by a screw 26 or other suitable means. In order to adjust the plunger 19 longitudinally to thereby clamp the mandrel 23 between the heads 9 and 22, and expand the mandrel as will hereinafter more fully appear, there is a bracket 27 extended from the machine frame in which is rotatably mounted the adjusting screw 28, said screw being held from longitudinal movement by the collars 29 and 30, Fig. 1, and its screw portion 31 being threaded into the block 32 screwed in the end of the plunger 19, and a suitable hand wheel 33 being provided for properly turning the adjusting screw 28.

From the construction thus far described it will be apparent that when the plunger 19 is withdrawn, to the left, Fig. 1, by the adjusting screw 28 the mandrel 23 may be bodily removed from between the heads 9 and 22, and a new mandrel substituted therefor. This action may be further facilitated by the endwise movable sleeve 10. When, however, the mandrel has been properly set between the heads 9 and 22, and the lever 17 actuated to connect the pinion 6 with the shaft 5, said shaft 5, and perforce the mandrel 23 will be rotated, the end thrust of the heads 9 and 22 being sustained by the roller bearings hereinbefore described. As hereinbefore pointed out the mechanism above described is likewise utilized to expand, and it may be also, to contract the mandrel, to understand which action the mandrel itself will first be definitely described in connection with the illustrated form thereof.

The mandrel comprises the core 34, Figs. 2, 3, and 4, which extends longitudinally, and preferably the full length of the mandrel and is provided with a longitudinal slot in which operates the slide 35. The slide 35 has a series of wedge portions or inclines 36, Fig. 2, and obviously the number of these wedge pieces or inclines may be varied to suit the conditions of use, the purpose of the same being to cause the expander, as will hereinafter appear, to move radially of the mandrel or outward to expand the same. Likewise extending longitudinally of the mandrel is the expander 37 having the inclined portions 38 to co-act with the wedge or inclined portions 36 of the slide, the construction being such that upon longitudinal movement of the slide 35 to the right, Fig. 2, the expander 37 will be moved outward, and upon movement of the

slide 35 in the opposite direction the expander 37 will be freed to move inward of the mandrel. The inclines 38 on the expander 37 are preferably formed by and in the portions 39 in the expander, as indicated in Fig. 2, which subserve the purpose of preventing longitudinal withdrawal of the slide 35 by reason of contact of the complementary portions of the wedge pieces 36 and the surfaces of the notch portions 39.

From the construction thus far described it will be apparent that if the expander 37 be prevented from longitudinal movement, the slide 35 while being permitted longitudinal movement sufficient to insure expansion and contraction of the mandrel, as will hereinafter appear, will yet be prevented from longitudinal movement sufficient to withdraw the slide entirely from the mandrel. It is not always essential that means be provided to prevent this longitudinal withdrawal of the slide and expander, but a convenient and practical form of the invention as herein shown, provides means to this end, as follows. The expander 37 is provided with slots 40, two of said slots being shown, but any convenient number being permissible and said slots extend transversely of the expander. Passing through the core 34, as indicated in Figs. 3 and 4 by dotted lines, are the limiting pins 41, see cross section Fig. 2, which pins engage the slots 40 of the expander, the construction being such that while the slots 40 and limiting pins 41 permit the expander to move radially of the mandrel, they yet prevent longitudinal movement of the expander 37. Since the expander 37 cannot move longitudinally and since it is provided with the recesses 39 substantially complementary to the wedge portions 36 of the slide, it follows that the slide 35 can itself be not bodily removed from the mandrel unless the expander is moved outward to entirely disengage the slots 40 and pins 41, a condition which, as will hereinafter appear, does not arise in practice. Extending longitudinally of and forming the major part of the surface of the mandrel are the mandrel sections 42. These sections are hinged at their adjacent longitudinal edges to the core of the mandrel and their contiguous free longitudinal edges engage the inclined surface of the head of the expander, as indicated in Figs. 3 and 4. In other words, the expander 37 is provided with an enlarged head portion provided along its longitudinal edges with an incline 43, and the free end portions of the mandrel sections are provided with complementary engaging inclines 44, the construction being such that upon radial movement of the expander 37 under the action of the slide 35, the free ends of the mandrel sections will be separated.

In order that the cylindrical contour of the mandrel may be continuous and uninterrupted between the free end portions of the mandrel sections, the head of the expander 5 has its surface 45, between its inclined edge portions 43 formed in the arc of a circle which is that of the cylindrical contour of the mandrel when expanded, so that when the parts have assumed the position in Fig. 10 3 with the free ends of the mandrel sections separated by the expander, the surface 45 of the expander will constitute part of the supporting surface of the mandrel and form, with the exterior surfaces of the 15 mandrel sections, an interrupted cylindrical surface.

The mandrel sections may be connected to the mandrel in various ways, the essential being that they may be moved toward and 20 from each other, and when moved from each other or in expanded condition, that they shall, with the other elements of the mandrel, present a continuous and uninterrupted cylindrical surface. As one means to this 25 end the core 34 has a cap piece 46 extending longitudinally thereof and screwed thereto by the screws or other desirable securing means 47, said cap piece 46 having an exterior surface 48 formed in the arc of a 30 circle corresponding to that of the cylindrical contour of the mandrel. In order that the securing screws or other devices 47 which hold the cap piece 46 in place with respect to the core 34, may not interrupt the 35 cylindrical contour of the mandrel, the heads of said screws are turned or ground off to bring their exterior end portions into conformation with the cylindrical contour of the mandrel. Obviously, the number of 40 screws 47 may be varied, three only being shown in the drawings. The core 34 and cap piece 46 are provided with recesses to receive the longitudinally rounded or hinged end portions 49 of the mandrel sections, 45 whereby said mandrel sections are hinged with relation to the core and cap piece of the mandrel.

In order that the hinged connection of the mandrel sections with the mandrel may not 50 cause a longitudinal interruption in the surface of the mandrel when the mandrel sections are expanded into the position indicated by Fig. 3, the portions 50 of the mandrel sections are formed to abut against corresponding portions of the cap 46 when the 55 mandrel sections are in their normal expanded position. Ordinarily the mandrel sections will maintain their longitudinal position with respect to other parts of the mandrel by reason of their hinge connections therewith, but in order to insure that they shall not move longitudinally with respect to said parts the mandrel sections are each provided with an interior recess 51, 60 Fig. 5, into which extend the heads of the

screws or other stopping devices 52 projecting from the core 34 of the mandrel, the construction being such that while the heads of the screws or pins 52 prevent longitudinal 70 movement of the mandrel sections with respect to the core 34, they in no way interfere with the free expanding and contracting movement of the mandrel sections, nor do they extend to the outer surface of said mandrel sections, it being understood that 75 the exterior supporting surface of the mandrel sections is continuous and uninterrupted.

From the construction described as one embodiment of the present invention it will be understood that by longitudinal movement of the slide 35 in one direction, the expander 37 will be moved outward and by its outward movement will separate the free ends of the mandrel sections until the shoulders 50 of said sections abut against corresponding shoulders of the cap piece 46, at which time the exterior surface 45 of the expander will have been insinuated between the two free end portions of the mandrel 90 sections and together with said mandrel sections, and rounded surface of the cap 46, will complete an uninterrupted continuous cylindrical surface for the mandrel. Movement of the slide 35 in the opposite direction will enable the expander 37 to move 95 radially inward, thereby permitting the mandrel sections to be collapsed into the position indicated in Fig. 4.

When the mandrel is placed in the machine and the parts are ready for the winding operation it is desirable that the mandrel be in expanded position with its continuous uninterrupted cylindrical surface ready to receive the first layer of paper and from 105 the construction hereinbefore described it will be apparent that when one end of the mandrel is placed in the head 9 and the other end in the head 22 the slide 35 will, by longitudinal movement of the plunger 19 110 as the mandrel is clamped in place, be moved to the right, Fig. 2, and the parts of the mandrel will automatically assume expanded condition. On the other hand, when the machine is stopped and the winding 115 completed it is desirable that the slide 35 be moved reversely, to permit collapse of the mandrel and to this end the head 9, Fig. 2, may, if desired, be provided with a spring 53, adapted to bear upon the end 120 of the slide 35, the construction being such that upon retractive movement of the plunger 19 to release the mandrel, the spring 53 may automatically move the slide 35 and permit contraction or collapse of the mandrel parts. It is evident that upon rotation 125 of the shaft 5 the mandrel 23 will be rotated, and such rotation may be produced by the clamping or frictional engagement of the ends of the mandrel, as indicated in Figs. 1 130

and 2, or suitable lugs on the head 9, as indicated by dotted lines in Fig. 5 may engage suitable recesses in the core 34, Fig. 5, to produce such rotative movement of the mandrel.

Obviously, the expander and the slide may be formed somewhat differently from the illustrated embodiment of the invention, and the number of wedge portions or inclines 36 on the slide and corresponding recesses and inclines on the expander may be varied; and it would likewise be obvious that the slide 35 instead of being automatically moved by the spring 53 when the mandrel is unclamped from its operative position, may be moved longitudinally by hand or by an instrument striking the end of the slide after the mandrel has been moved from the machine. It will also be noted that when the mandrel is in collapsed condition as in Fig. 4, the end of slide 35, the left end in Fig. 2, will project somewhat beyond the end of the mandrel, so that when the mandrel is clamped between the heads 9 and 22, the slide will be automatically moved longitudinally to expand the mandrel. Obviously, the slide may be similarly moved by hand and in either event the cap pieces or sockets in the heads 9 and 22 will limit the expanding movement and determine when the mandrel has been properly expanded.

Claims.

1. In a paper winding machine, a collapsible mandrel comprising a core, mandrel sections hinged with relation to the core, an expander engaging the free end portions of the mandrel sections throughout the length thereof, and means movable longitudinally of the mandrel to cause outward movement of the expander between the free edges of the mandrel sections whereby, when expanded, a continuous uninterrupted cylindrical surface is provided, substantially as described.

2. In a paper winding machine, a collapsible mandrel comprising a core, mandrel sections hinged with relation to the core, a slide movable longitudinally of the mandrel, an expander engaging the free end portions of the mandrel sections, throughout the length thereof and complemental inclines on the expander and slide for moving the expander outward between the edges of the mandrel sections.

3. In a winding machine, a collapsible mandrel comprising a core, a slide movable longitudinally with respect to the core, an expander, said expander and slide having complemental inclined engaging portions, and mandrel sections hinged at adjacent longitudinal edges and engaging the expander at their adjacent free edges throughout the length of said sections.

4. A mandrel for winding paper, com-

prising a core, a slide mounted on said core for longitudinal movement, mandrel sections hinged along their longitudinal edges to the core, an expander extending longitudinally of the core throughout the length thereof and having a surface constituting part of the mandrel surface when expanded, said slide and expander so formed and arranged with relation to each other as to cause outward movement of the expander between the free edges of the mandrel sections upon longitudinal movement of the slide in one direction.

5. In a paper winding machine, a collapsible mandrel comprising a core, mandrel sections hinged with relation to the core, a slide movable longitudinally of the mandrel, an expander engaging the free end portions of the mandrel sections and extending the full length thereof, means permitting inward and outward radial movement of the expander but restricting longitudinal movement thereof, and complemental inclines on the expander and slide for moving the expander outward between the edges of the mandrel sections.

6. In a winding machine, a collapsible mandrel comprising a core, a slide movable longitudinally with respect to the core, an expander, pin and slot connections between the expander and core preventing longitudinal movement of the expander, said expander and slide having complemental incline engaging portions, and mandrel sections hinged at adjacent longitudinal edges and engaging the expander at their adjacent free edges whereby an uninterrupted cylindrical surface is provided throughout the length of the mandrel.

7. A mandrel for winding paper, comprising a core having a cap extending longitudinally thereof, mandrel sections hinged between the cap and the core, an expander having a part to extend between the free edge portions of the mandrel sections and constituting part of the mandrel surface, a slide movable longitudinally of the mandrel, and means for causing the expander to move outward as the slide is moved longitudinally.

8. A mandrel for paper winding machines, comprising a core, a slide mounted for movement longitudinally of the core, an expander extending longitudinally of the core the length thereof and movable radially, said slide and expander so formed and arranged with relation to each other as to convert longitudinal movement of the slide in bodily radial movement of the expander, a head on said expander, and mandrel sections pivotally connected to the core and having their free edge portions in engagement with the longitudinal edge portions of the expander, said head having a surface between its longitudinal edges conforming

to the surface of the mandrel when expanded.

9. A mandrel for paper winding machines, comprising a core, a slide mounted
5 for movement longitudinally of the core, an expander extending longitudinally of the core the length thereof and movable radially, means between the expander and slide to convert longitudinal movement of the slide
10 in bodily radial movement of the expander, a head on said expander having inclined edge portions, and mandrel sections pivotally connected to the core and having their free edge portions in engagement with the
15 longitudinal edge portions of the expander, said head having a surface between its longitudinal edges conforming to the surface of the mandrel when expanded.

10. A mandrel for paper winding machines, comprising a core, a cap secured to the core, and having a surface forming part of the surface of the mandrel, an expander having a surface between its longitudinal edges forming part of the surface of the
25 mandrel the length thereof, mandrel sections extending between the cap and expander and having surfaces completing the surface of the mandrel, a slide movable longitudinally of the mandrel, said slide and expander so formed and arranged with relation to each other for moving the expander
30 outward between the ends of the mandrel sections to expand the mandrel when the slide is moved in one direction and for permitting the expander to move inward when the slide is moved in the opposite direction.

11. A mandrel for paper winding machines, comprising a core, a cap secured to the core and having a surface forming part
40 of the surface of the mandrel, an expander having a surface between its longitudinal edges forming part of the surface of the mandrel the length thereof, mandrel sections extending between the cap and expander and having surfaces completing the
45 surface of the mandrel, said mandrel sections and cap having shoulders which come into contact when the mandrel is expanded, a slide movable longitudinally of the mandrel, said slide and expander so formed and arranged with relation to each other for moving the expander outward between the
50 ends of the mandrel sections to expand the mandrel when the slide is moved in one direction and for permitting the expander to move inward when the slide is moved in the opposite direction.

12. In a machine for winding paper, the combination of a mandrel, means movable

longitudinally of the mandrel for expanding the mandrel, rotatable heads for supporting the ends of the mandrel, and means connected to one of said heads for moving the mandrel expanding means.

13. In a machine for winding paper, the
65 combination of a mandrel, a slide movable longitudinally of the mandrel for expanding the mandrel, rotatable heads for detachably supporting the mandrel, and means connected to one of said heads for moving
70 them toward each other and to move the slide longitudinally for simultaneously expanding the mandrel.

14. In a machine for winding paper, the
75 combination of a mandrel, a slide movable longitudinally of the mandrel for expanding the mandrel, rotatable heads for detachably supporting the mandrel, means connected to one of said heads for moving
80 them toward each other and to move the slide longitudinally for simultaneously expanding the mandrel, and means for automatically moving the slide in the opposite direction to permit collapse of the mandrel when the said heads are separated to release
85 a mandrel.

15. In a machine of the character described, the combination of an expansible and contractible mandrel, rotary heads having sockets for engaging the exterior of the
90 mandrel ends, a slide carrying one of said heads, a slide movable longitudinally of the mandrel for expanding it, and means for moving the slide carrying one of said heads toward the other head to clamp the mandrel and simultaneously expand the same.

16. In a machine of the character described, the combination of an expansible and contractible mandrel, rotary heads having sockets for engaging the exterior of the
100 mandrel ends, a slide carrying one of said heads, a slide movable longitudinally of the mandrel for expanding it, means for moving the slide carrying one of said heads toward the other head to clamp the mandrel and simultaneously expand the same,
105 and a spring to move the mandrel expanding slide in the opposite direction to permit the mandrel to be contracted when the heads are separated to release the mandrel.

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

GEORGE B. WARNER.

Witnesses:

HAROLD M. ALLEN.

FANNIE E. TENNEY.