July 12, 1949. E. G. HILL 2,475,895

WINDING MACHINE

Filed July 12, 1945 2 Sheets-Sheet 1

Fig. 1

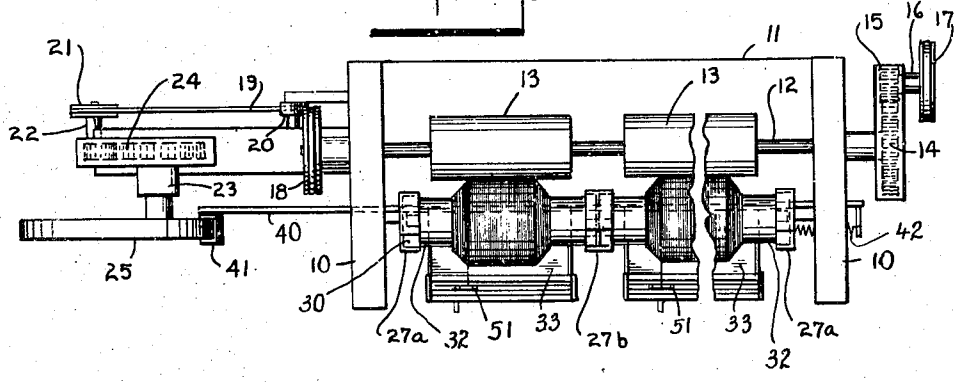


Fig. 2

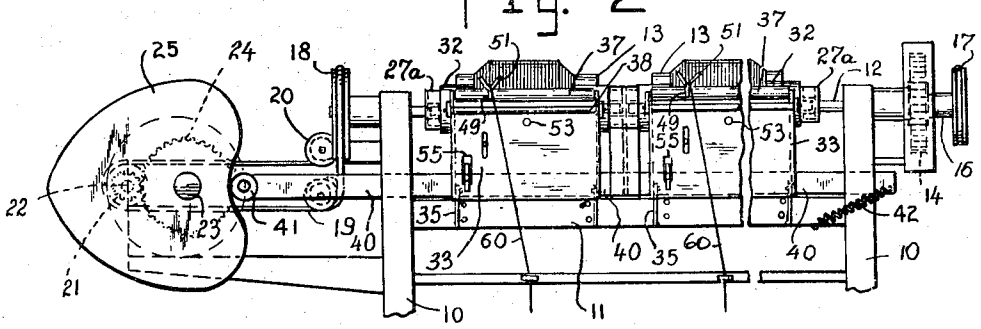
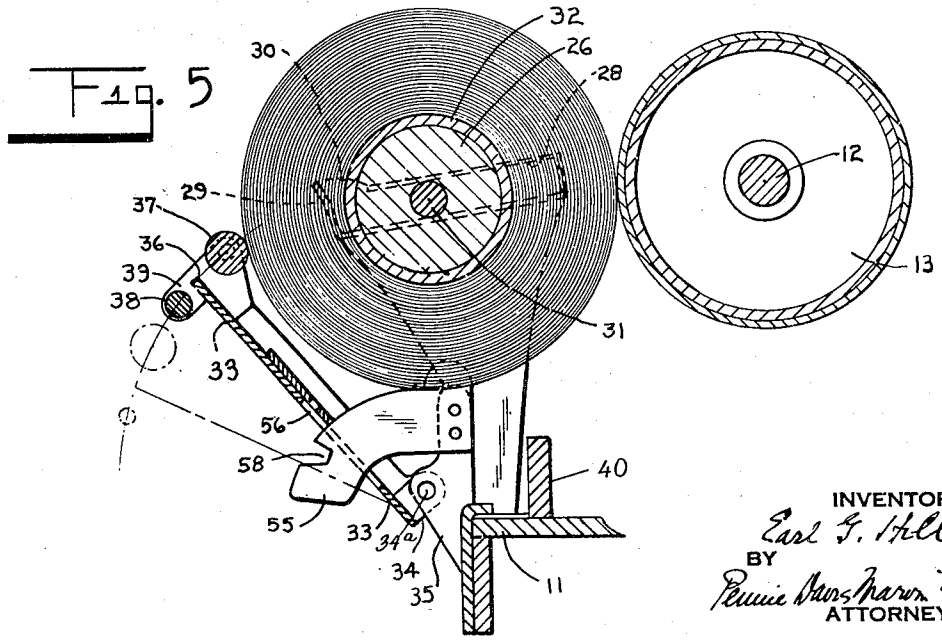


Fig. 5



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Fig. 3

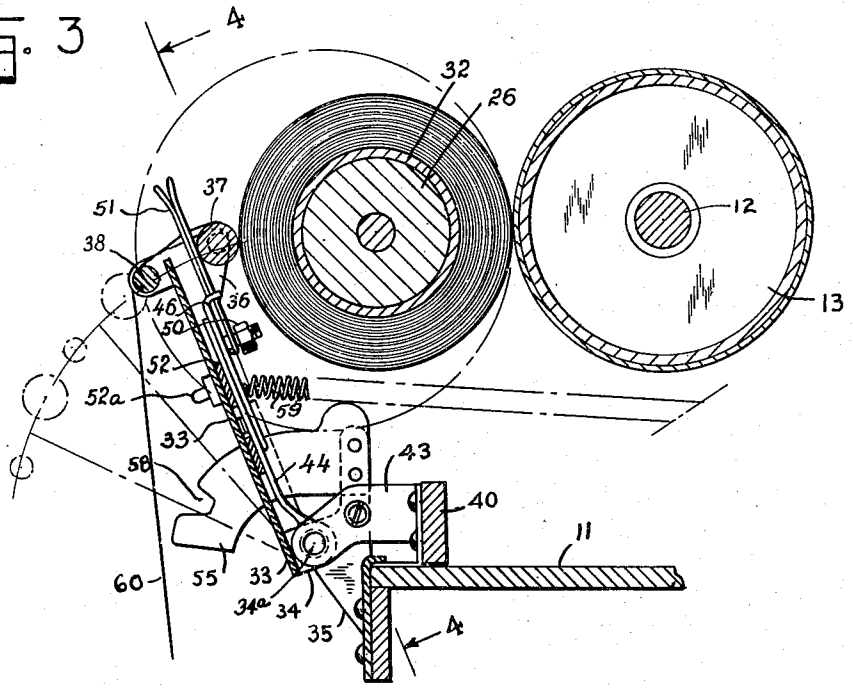


Fig. 4

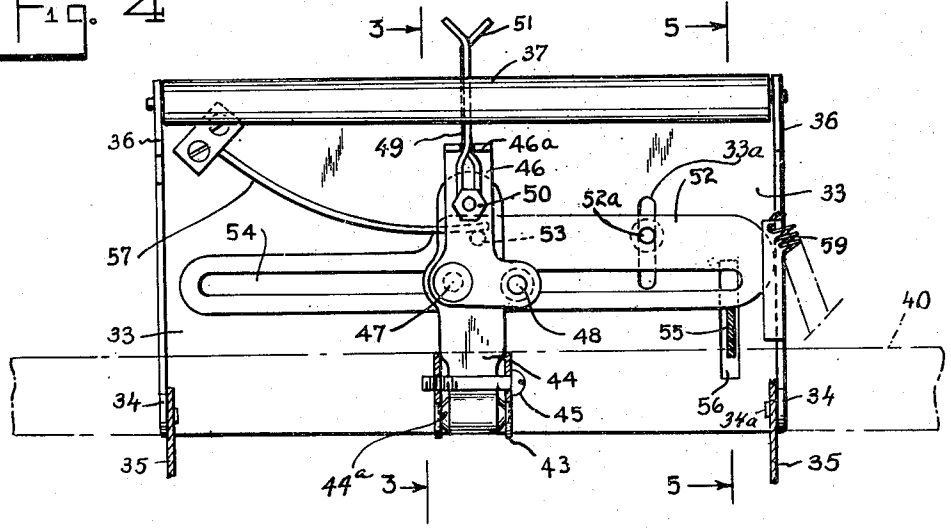
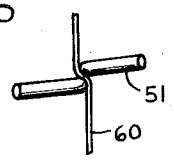


Fig. 6



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Patented July 12, 1949

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2,475,895

WINDING MACHINE

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Application July 12, 1945, Serial No. 604,627

17 Claims. (Cl. 242—35.5)

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This invention relates to machines for winding packages of yarn, thread, etc., and is concerned more particularly with a winding machine containing novel means for winding the strand material upon a headless bobbin or tube and so manipulating the thread guide that the package produced has tapered or conical ends. By reason of the inclusion of the new features, the machine of the invention is simpler in construction than prior machines for the same purpose and it is less expensive to build and easier to operate and maintain in working condition.

The new machine includes conventional means for rotating the bobbin or tube and such means may be of either of the well known types for driving the bobbin or tube at a constant surface speed or at a constant number of revolutions per minute, as may be desired. A frame is pivotally mounted on a fixed support adjacent the bobbin and is provided with means maintained in engagement with the package building up on the bobbin by means which urge the frame toward the bobbin. The frame thus swings at right angles to the axis of the bobbin as the package increases in diameter. A traverse bar is mounted on the support independently of the frame and extends lengthwise of the bobbin, and the bar is reciprocated endwise during the operation of the machine. A thread guide is mounted on the frame and is operatively connected to the traverse bar so as to reciprocate therewith. At each end of its stroke, the guide is rocked by means carried by the frame, and as the frame is swung during the building up of the package, the action of the rocking means is varied so that the thread guide is given the proper motion to produce the tapered ended package.

For a better understanding of the invention, reference may be made to the accompanying drawings, in which

Fig. 1 is a plan view of a multiple winding machine of the invention;

Fig. 2 is a front elevational view of the machine of Fig. 1;

Fig. 3 is a sectional view through the machine on the line 3—3 of Fig. 4;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3;

Fig. 5 is a sectional view on the line 5—5 of Fig. 4; and

Fig. 6 is a plan view of the thread guide showing the course of the yarn therethrough.

In the drawings, a drum winding machine embodying the invention is illustrated, and this machine includes a supporting structure comprising

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vertical frame members 10 and longitudinal members 11 of any suitable construction. A shaft 12 mounted in bearings carried by the structure extends lengthwise of the latter and is provided at intervals with conventional cork driving rolls 13. The shaft carries a gear 14 at one end, which meshes with a gear 15 on a shaft 16 provided with a driving pulley 17, although shaft 12 may be driven in any other convenient manner. At its opposite end, shaft 12 carries a driving pulley 18, around which is trained a belt 19. The belt passes around idlers 20 and about a pulley 21 on a shaft 22, which drives a shaft 23 through reduction gearing generally designated 24. Shaft 23 carries a cam 25.

A mandrel 26 is mounted for rotation opposite each cork roll 13, and for this purpose, a number of brackets are attached to the supporting structure to extend upwardly therefrom. The end brackets 27*a* lie beyond the end cork rolls, and the intermediate brackets 27*b* lie opposite the faces between adjacent cork rolls. Each end bracket 27*a* is provided with a U-shaped channel 28, which is open laterally and extends downwardly in a direction away from the adjacent cork roll. At its lower end, the channel is closed by a wall 29, and upwardly from the wall, the top of the channel is cut away, as at 30, to permit the introduction of the gudgeon 31 of the mandrel. Each intermediate bracket 27*b* is formed with a pair of channels similar to channels 28 and placed back to back so that each intermediate bracket supports the gudgeons of adjacent mandrels. The mandrels are of a size to permit the bobbin or tubes 32 to be fitted snugly thereover and may be provided with conventional means for securing the bobbins or tubes in place thereon.

A frame is pivotally attached to the longitudinal member 11 of the supporting structure opposite each mandrel and cork roll combination to swing about an axis substantially parallel with the axis of shaft 12. Each such frame comprises a plate 33 provided at its lower corners with brackets 34, which are pivotally attached at 34*a* to brackets 35 secured to the longitudinal frame member 11. At its outer end, the plate is provided with brackets 36 projecting toward the cork roll, and between these brackets 36 is mounted a roller 37, which is adapted to bear against the package being wound on the bobbin or tube on the mandrel. Roller 37 is spaced from the adjacent face of plate 33, as illustrated in Fig. 5, and one of the brackets 36 is secured to plate 33 by means of bolts, so that the bracket and roller

37 can be removed for cleaning purposes. A thread guiding rod 38 is mounted in brackets 39 on the outer face of plate 33.

A traverse bar 40 is mounted on top of the longitudinal member 11 of the supporting structure in suitable guides (not shown) to extend parallel to shaft 12 and the bar is provided at one end with a roller 41 engaging the surface of cam 25. As the cam is rotated, the bar is reciprocated endwise, and it is kept in constant contact with the surface of the cam in any convenient manner, as by means of a spring 42 attached to the bar and bearing against a part of the supporting structure. Opposite each cork roll, a pair of spaced brackets 43 are attached to the outer face of the traverse bar, and an arm 44 is pivotally mounted in each pair of brackets. For this purpose, the brackets are connected together near the bar by a bolt 45, and the arm is formed at its end with a loop encircling a pin 44a having coned ends which are detachably received in openings near the ends of the brackets. The axis about which arm 44 swings is coincident with the axis about which frame plate 33 swings, so that as the frame swings outwardly, arm 44 may swing with it and continue to lie parallel thereto.

A lever 46 is pivoted at 47 on arm 44 well below the top thereof. The lever is of bell crank form with legs of unequal length, and its shorter generally horizontal leg is provided with a roller 48 on its rear face. The longer upright leg of lever 46 carries a thread guide 49, which may conveniently be formed of a length of wire looped upon itself and held in place by straddling a stud 50 on the outer face of the upright leg of lever 46. The thread guide is further held in place by passing through a slot in flange 46a at the upper end of lever 46. The two branches of the thread guide are in alignment above the end of lever 46 and pass between roller 37 and plate 33, and the branches flare outwardly at their upper ends, as indicated at 51.

A guide plate 52 is pivotally mounted at 53 on the inner face of plate 33 of the frame, and the guide plate has a longitudinal slot 54, in which travels roller 48 on lever 46. A cam plate 55 attached to one of the brackets 35, in which plate 33 is mounted, extends outwardly at right angles to the plane of plate 33 and through an opening 56 in plate 33. This cam is engaged by one end of guide plate 52, and the guide plate is held in contact with the top surface of the cam by a spring 57 attached at one end to the frame plate 33 and bearing at its free end in a slot in the upper edge of that portion of guide plate 52 encircling the pivot stud 53.

The active surface of cam 55, against which the end of guide plate 52 bears, is a curve of uniformly increasing radius developed from a point on a vertical line through the axis on which the frame swings. Near its outer end, the cam is formed with a notch 58 in which the end of guide plate 52 may drop when the frame is swung far enough outwardly away from the package on the mandrel. When the guide plate drops into the notch, the frame is held in place free of the package, so that the latter can be moved downwardly and the mandrel gudgeons 31 can be moved outwardly through openings 30 to channels 28. In order that the guide plate may be released from the notch, it is provided near one end with a pin 52a which extends through a slot 33a in plate 33. By raising the pin, the end of guide plate 52 may be released from the notch to permit the frame to be moved back toward the package.

Each frame is urged to swing in a clockwise direction, as viewed in Fig. 3, by means of a spring 59 attached at one end to plate 33 and at its other end to a fixed part of the supporting structure of the machine. The action of the spring causes roller 37 to contact with the package being wound at all times. As the frame is swung away from the package during the growth of the latter, the contact of the thread guide with the outer surface of the roller causes arm 44 and lever 46 to swing with the frame. Since the axis on which arm 44 swings is coincident with the axis on which plate 33 swings, arm 44 and lever 46 are thus maintained in their original relation to plate 33 as the top of the frame swings outwardly.

At the start of the operation of the new winding machine, each frame is swung away from its mandrel by the operator, until its guide plate 52 drops into the notch in its cam. The mandrel can then be removed from its mounting and a tube slipped over it. The mandrel is then put back in its mounting and guide plate 52 released from the notch in the cam to permit the frame to be swung upwardly by its spring 59, until roller 37 on the frame engages the surface of the tube on the mandrel. The spring 59 causes the frame to force the tube into contact with the cork roll 13, as indicated in Fig. 3. The thread 60 from the supply is then passed upwardly over the guide bar 38, between the two branches of the thread guide 49, and over roller 37 to the tube on the mandrel. When the machine is started, the traverse bar is reciprocated by cam 25, and it moves each arm 44, each lever 46, and each thread guide 49 with it. As each lever 46 moves along the rear face of a plate 33, the engagement of roller 48 on the lever in the slot in guide 54 causes a backward rocking of lever 46 at each end of each stroke of the traverse bar. In such backward rocking of lever 46, its upper end moves backwardly, that is, in a direction opposite to that in which the lever as a whole is moving relative to its plate 33. The extent of such rocking movement of the levers depends on the inclination of the slots 54 of the respective guides 52, which are in turn controlled by their cams 55. As the packages build up, the axis of each mandrel moves away from its cork roll, and, similarly, its frame is moved outwardly. This causes its guide 52 to move along the surface of the related cam 55, and the inclination of the guide varies, under the control of the cam, to increase the backward rocking of the thread guide as it approaches each end of its stroke. The result of this action is to cause a progressive shortening of the traverse of each thread guide lengthwise of its mandrel, and each package is, accordingly, formed with tapered or coned ends.

In prior winding machines of the same general construction, it has been the practice to mount the traverse bar on the frame, so that the bar moves with the frame as the latter is swung outwardly during the building up of the package. In the new machine, the traverse bar is mounted on the support, rather than on the rocking frame, and this simplifies the construction and also makes it easier to maintain the machine in proper working condition. By forming lever 46 with a relatively short horizontal leg and a longer vertical leg, a slight change in the inclination of guide 52 produces a greater change in the traverse of the thread guide relative to the package. The active surface of cam 55 is, accordingly, relatively flat, so that guide 52 may readily move along it. The formation of the notch in the cam, into which

guide 52 may be received to lock the frame in inoperative position, makes it easy for the operator to remove full packages and place empty tubes in position. Also, when the frame is in its outermost position, the means for actuating the thread guide are fully exposed so that they can be kept clean and in proper order.

In the machine illustrated, the package is rotated by contact with the cork roll 13, but, if desired, the tube on which the package is to be wound may be mounted on a spindle in accordance with the usual practice. When this type of drive is used, no changes in the frame or the thread guide actuating mechanism are necessary.

In a single winding machine of the new construction, the traverse bar 40 is relatively short, but in a multiple machine, the bar extends the full length of the machine so as to actuate the thread guides for each of the packages being wound. Adjacent each package, the bar is provided with brackets 43 supporting an arm 44 for the frame of each package. The packages are, accordingly, all wound simultaneously and are of uniform formation.

By forming the arm 44 of sufficient length to extend well beyond the pivot point 47 of lever 46 and causing the thread guide 49 to pass between plate 33 and roller 37, the lever 46 is constantly maintained with its stud 48 in the slot in guide 52 without the use of additional means for the purpose. As the frame swings outwardly, roller 37 bearing on the thread guide causes the latter to move with it, and lever 46 and arm 44 are constantly maintained parallel to the plane of frame 33.

The new winding machine can be used for either twisting or redraw purposes, depending on whether the supply is rotated during the winding operation or remains stationary. In prior machines for such purposes, it has been the common practice to employ bobbins with heads and, when such bobbins are used, difficulties are encountered, since the traverse of the thread guide must be such as to lay the thread on the barrel of the bobbin to fill the space between the heads exactly. If the adjustment of the machine is not precise, therefore, perfect packages will not be produced. In the use of the new machine, it is not necessary to employ bobbins with heads, since the packages have tapered or coned ends which make them stable. Such a package can be wound without the exact adjustment of the machine above mentioned and the new machine, therefore, requires less attention than prior machines winding on bobbins with heads.

What is claimed is:

1. In a winding machine, the combination of a support, means on the support for rotating a package, a frame mounted on the support to swing about an axis substantially parallel to axis of rotation of the package, means on the frame engaging the package to cause the frame to swing as the package builds up, a traverse bar mounted for reciprocating movement only lengthwise of the package, an arm pivotally connected to the traverse bar to swing about an axis parallel thereto, a lever pivoted on the arm to swing in a plane substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, and stationary means on the support for changing the position of the guide as the frame swings.

2. In a winding machine, the combination of a support, means on the support for rotating a package, a frame mounted on the support to swing about an axis substantially parallel to axis of rotation of the package, means on the frame engaging the package to cause the frame to swing as the package builds up, a traverse bar mounted on the support for reciprocating movement only lengthwise of the package, an arm pivotally connected to the traverse bar to swing about an axis parallel thereto, a lever pivoted on the arm to swing in a plane substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, and means on the support, including a stationary cam, for changing the position of the guide as the frame swings.

3. In a winding machine, the combination of a support, means on the support for rotating a package, a frame mounted on the support to swing about an axis substantially parallel to axis of rotation of the package, means on the frame engaging the package to cause the frame to swing as the package builds up, a traverse bar mounted on the support for reciprocating movement only lengthwise of the package, an arm pivotally connected to the traverse bar to swing about the axis on which the frame swings, a lever pivoted on the arm to swing in a plane substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, and stationary means on the support for changing the position of the guide as the frame swings.

4. In a winding machine, the combination of a support, means on the support for rotating a package, a frame mounted on the support to swing about an axis substantially parallel to axis of rotation of the package, means on the frame engaging the package to cause the frame to swing as the package builds up, a traverse bar mounted on the support for reciprocating movement only lengthwise of the package, an arm pivotally connected to the traverse bar to swing about the axis on which the frame swings, a lever pivoted on the arm to swing in a plane substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, and means on the support, including a stationary cam, for changing the position of the guide as the frame swings.

5. In a winding machine, the combination of means for rotating a package, a support, a frame mounted on the support to swing about an axis substantially parallel to the axis of rotation of the package, means on the frame engaging the package and causing the frame to swing as the package builds up, a traverse bar mounted independently of the frame, means for reciprocating the bar endwise and lengthwise of the package, an arm connected to the traverse bar to swing transversely thereof, a lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, and stationary means on the support for engaging the guide and changing the position thereof as the frame swings.

6. In a winding machine, the combination of means for rotating a package, a support, a frame mounted on the support to swing about an axis substantially parallel to the axis of rotation of

the package, the frame being urged into engagement with the package so as to be swung thereby as the package builds up, a traverse bar mounted independently of the frame, means for reciprocating the bar endwise and lengthwise of the package, an arm connected to the traverse bar to swing on an axis substantially parallel to the axis on which the frame swings, a lever pivoted on the arm to swing in a plane substantially parallel to the axis of rotation of the package, a thread guide carried by the lever, a guide pivotally mounted on the frame and engaging the lever to cause it to swing as it is moved with the traverse bar, and a fixed cam on the support engaging the guide and changing the position thereof as the frame swings.

7. In a winding machine, the combination of a support, a series of means on the support for rotating respective packages in endwise alignment, a frame mounted on the support adjacent each package to swing about an axis substantially parallel to the axis of rotation of the package, means on each frame engaging its package to cause the frame to swing as the package builds up, a traverse bar mounted independently of the frames and extending lengthwise of the series of packages, means for reciprocating the traverse bar endwise, a plurality of arms, one for each frame, connected to the traverse bar opposite the respective frames to swing transversely of the bar, a lever pivotally mounted on each arm to swing substantially parallel to the axis on which the associated frame swings, a thread guide carried by each lever, a guide pivoted on each frame and engaging the lever associated with that frame to swing it as it is moved with the traverse bar, and a plurality of cams, one for each lever, mounted on the support and engaging their respective levers to change the position of the latter as the frame associated with the lever swings.

8. In a winding machine, the combination of a rotary driving member, a mandrel supported at its ends for rotation parallel to the axis of rotation of the member, a support for the mandrel permitting it to move away from a position in which it is engaged by the driving member, a frame mounted to swing about an axis substantially parallel to the axis of rotation of the driving member, means for urging the frame toward the driving member, means on the frame engaging the package being wound on the mandrel to cause the frame to swing as the package builds up, a traverse bar mounted independently of the frame, means for reciprocating the bar endwise in the direction of the length of the package, an arm connected to the traverse bar to swing transversely thereof, a lever pivoted on the arm to swing parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, and stationary means on the support for engaging the guide and changing the position thereof as the frame swings.

9. In a winding machine, the combination of means for rotating a package, a support, a frame mounted on the support to swing about an axis substantially parallel to the axis of rotation of the package, means on the frame engaging the package and causing the frame to swing as the package builds up, a traverse bar mounted independently of the frame and at one side thereof, means for reciprocating the bar endwise in the direction of the length of the package, an arm

connected to the traverse bar to swing about the axis on which the frame swings, a bell crank lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by one leg of the lever, a guide pivoted on the frame and engaging the other leg of the lever to swing the lever as it is moved with the traverse bar, and stationary means on the support for engaging the guide and changing the position thereof as the frame swings.

10. In a winding machine, the combination of means for rotating a package, a support, a frame pivotally mounted on the support to swing about an axis substantially parallel to the axis of rotation of the package, a roller carried by the frame and engaging the package and causing the frame to swing as the package builds up, a traverse bar disposed beneath the package and to the rear of the frame, means for reciprocating the bar endwise and lengthwise of the package, an arm connected to the traverse bar to swing about the axis on which the frame swings, a lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever and extending above the roller, a guide member pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, the roller engaging the thread guide and holding the lever in operative relation to the guide member, and stationary means on the support for engaging the guide member and changing the position thereof as the frame swings.

11. In a winding machine, the combination of means for rotating a package, a support, a frame mounted on the support to swing about an axis substantially parallel to the axis of rotation of the package, means on the frame engaging the package and causing the frame to swing as the package builds up, a traverse bar mounted independently of the frame, means for reciprocating the bar endwise and lengthwise of the package, an arm connected to the traverse bar to swing transversely thereof, a lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, and a cam mounted on the support and engaging the guide to change the position thereof as the frame swings, the cam being provided with a notch engageable by the guide to hold the frame in inoperative relation to the package.

12. In a winding machine, the combination of means for rotating a package, a support, a frame mounted on the support to swing about an axis substantially parallel to the axis of rotation of the package, means on the frame engaging the package and causing the frame to swing as the package builds up, a traverse bar mounted independently of the frame, means for reciprocating the bar endwise and lengthwise of the package, an arm connected to the traverse bar to swing transversely thereof, a lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, a cam mounted on the support and engaging the guide to change the position thereof as the frame swings, the cam extending through an opening in the frame and being provided with a notch engageable by the guide to

hold the frame in inoperative relation to the package, and means attached to the guide and extending through an opening in the frame for releasing the guide from the notch.

13. In a winding machine, the combination of means for rotating a package, a support, a frame mounted on the support to swing about an axis substantially parallel to the axis of rotation of the package, means on the frame engaging the package and causing the frame to swing as the package builds up, a traverse bar mounted independently of the frame, means for reciprocating the bar endwise and lengthwise of the package, an arm connected to the traverse bar to swing transversely thereof, a lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, a cam rigidly mounted on a support for engaging the guide and changing the position thereof as the frame swings, and a spring for maintaining the guide in contact with the cam, the cam having a notch adapted to receive the guide to hold the frame in inoperative relation to the package.

14. In a winding machine, the combination of means for rotating a package, a support, a frame mounted on the support to swing about an axis substantially parallel to the axis of rotation of the package, a roller at the outer end of the frame engaging the package and causing the frame to swing as the package builds up, means acting on the frame to maintain the roller in contact with the package, a traverse bar mounted independently of the frame, means for reciprocating the traverse bar endwise and lengthwise of the package, an arm connected to the traverse bar to swing transversely thereof, the arm extending generally parallel to the plane of the frame toward outer end thereof, a lever pivoted on the arm adjacent the mid-point thereof to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever and lying in contact with the roller on the side thereof away from the package, a guide pivoted on the frame and engaging the lever to swing it as it is moved with the traverse bar, and a stationary cam mounted on the support to engage the guide and change the position thereof as the frame swings.

15. In a winding machine, the combination of means for rotating a package, a support, brackets on the support, a frame pivotally mounted in the brackets to swing about an axis substantially parallel to the axis of rotation of the package, a member on the frame engaging the package and causing the frame to swing as the package builds up, means urging the frame to cause the member to engage the package, a traverse bar mounted independently of the frame, a bracket mounted on the traverse bar, an arm pivotally mounted in the bracket to swing about the axis on which the frame swings, a lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to swing it as it is reciprocated with the traverse bar, a cam mounted on the support, and means for maintaining the guide in contact with the cam, the cam changing the position of the guide as the frame swings.

16. In a winding machine, the combination of a rotary driving member, a mandrel for supporting a bobbin on which the package is to be formed, a pair of channel members attached to the support and supporting and guiding the ends of the mandrel as the mandrel moves toward and away from the driving member, a frame mounted on the support to swing about an axis substantially parallel to the axis of rotation of the package, a roller on the frame engageable with the package, means for urging the frame to maintain the roller in contact with the package and the package in contact with the driving member, a traverse bar mounted independently of the frame and to the rear thereof, means for reciprocating the bar endwise and lengthwise of the package, an arm pivotally connected to the traverse bar to swing transversely thereof, a lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, a guide pivoted on the frame and engaging the lever to cause it to swing as it is reciprocated with the traverse bar, a cam mounted on the support, and a spring maintaining the guide in contact with the cam, the cam varying the position of the guide as the frame swings.

17. In a winding machine, the combination of means for rotating a package, a frame mounted to swing about an axis substantially parallel to the axis of rotation of the package, a roller mounted on the frame and adapted to engage the package and swing the frame as the package builds up, a traverse bar mounted independently of the frame and reciprocating endwise and lengthwise of the package, an arm connected to the traverse bar to swing about the axis on which the frame swings, a lever pivoted on the arm to swing substantially parallel to the axis on which the frame swings, a thread guide carried by the lever, and means for rocking the lever rearwardly at each end of its stroke with the traverse bar, including a guide pivotally mounted on the frame.

EARL G. HILL.

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