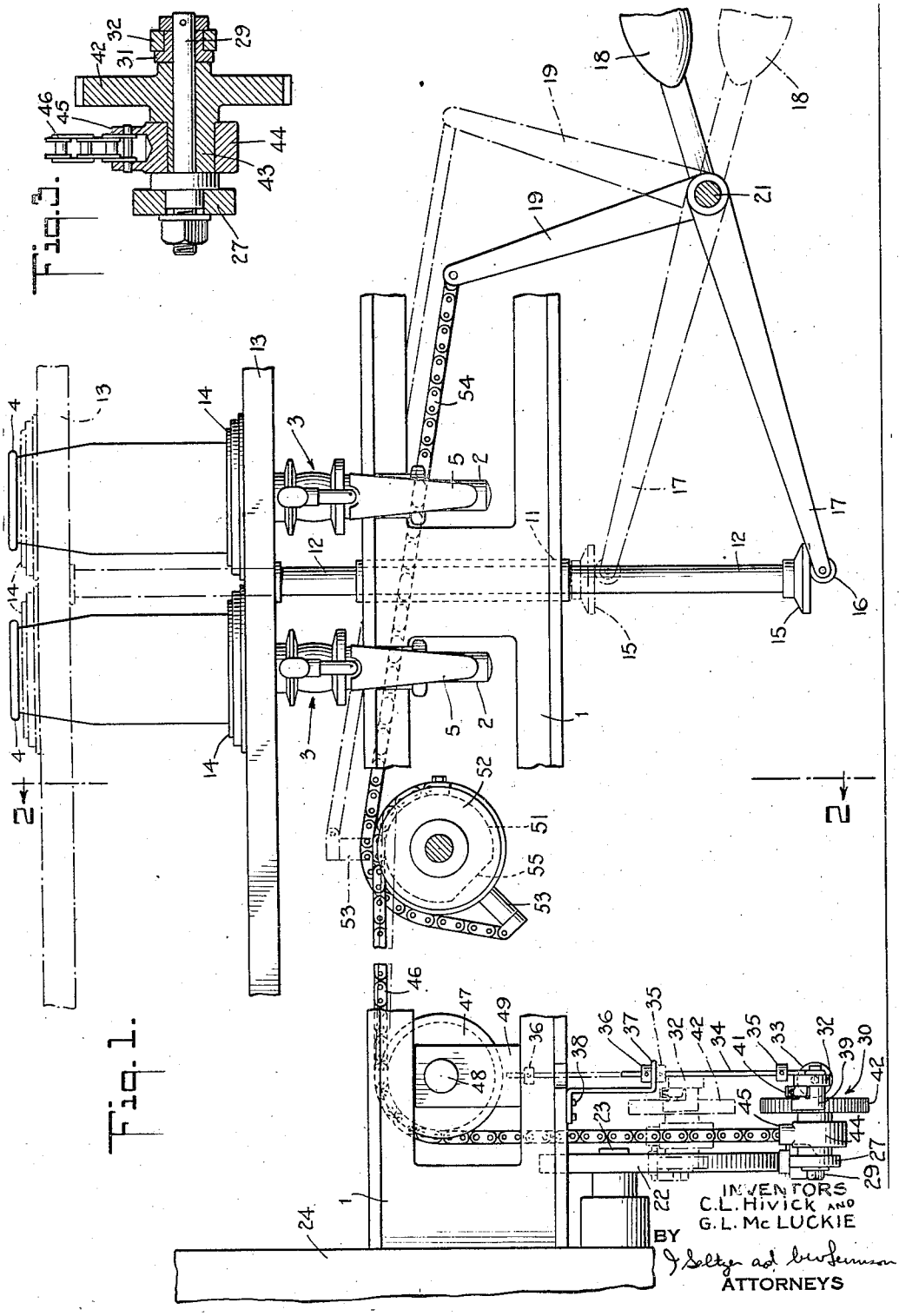
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YARN WINDING

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YARN WINDING

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Fig. 4.

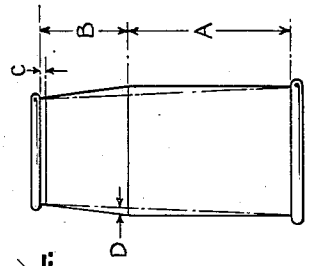


Fig. 2.

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YARN WINDING

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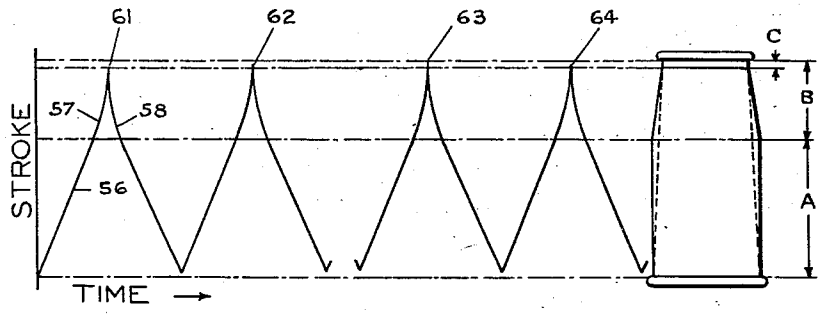


Fig. 5

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YARN WINDING

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Application February 28, 1942, Serial No. 432,722

9 Claims. (Cl. 242—43.4)

This invention relates to the winding of yarn into packages, and relates more particularly to the production of improved yarn packages.

Ring twisters commonly employed for winding yarn packages, particularly those containing from one to two pounds of yarn, are equipped with traverse driving mechanisms which furnish a constant traverse stroke at all times. Due to variations in bobbin dimensions and to the absence of means for adjusting individual spindles, poorly wound yarn packages are often obtained. It is accordingly an important object of this invention to provide a novel arrangement adapted to be attached to a ring twister which will cause to be produced yarn packages of improved characteristics.

Another object of this invention is the provision of a novel creeper gear arrangement adapted to be attached to a ring twister for controlling the traverse stroke in such a manner that the wind of the take-up bobbin is continuously varied.

A further object of this invention is to provide in a ring twisting device a novel arrangement for causing the ring rail thereof to modify its stroke when it reaches a predetermined position in relation to the yarn package being built, in order to form taper-top yarn packages.

Other objects of this invention, together with certain details of construction and combinations of parts will appear from the following detailed description and claims.

Although this invention is applicable to the packaging of yarns of any natural or synthetic fibers or filaments, it is particularly effective in the packaging of continuous filament yarns having a smooth surface which causes the same to have a geater tendency to shift or slide each other when in package form. This invention may be applied to any winding device employing a traverse bar carrying a ring for directing the yarn on to a take-up package, examples of such devices being "ring twisters" where yarn is pulled from a supply package and wound, with or without adding twist, on to a bobbin, and "ring spinning machines" where artificial filaments are formed by extruding a spinning solution through a plurality of suitable jets into a setting medium and then grouping the filaments formed into a yarn and winding said yarn on to a take-up spool or bobbin with the aid of a ring and traveler.

In the drawings, where this invention is shown applied to a ring twister,

Figure 1 is a front elevational view of a ring twister device modified in accordance with this invention,

Figure 2 is a side elevational view taken along line 2—2 of Figure 1 in the direction of the arrows,

Figure 3 is a cross-sectional view taken on line 3—3 of Figure 2 in the direction of the arrows but on a slightly enlarged scale,

Figure 4 is an elevational view of a yarn package produced in accordance with this invention,

Figure 5 is a view showing graphically the build and internal structure of the yarn package produced in accordance with this invention.

Like reference numerals indicate like parts throughout the several views of the drawings.

Referring to the drawings, reference numeral 1 is applied to the main horizontal frame bar of a ring twisting machine. This bar extends across the front of the machine and is suitably supported with legs, braces, end pieces, etc. that are not shown on the drawings as their exact structure is not necessary to an understanding of the invention. Mounted along the bar 1 are wells 2 adapted to journal and lubricate spindle and whorl assemblies generally indicated by reference numeral 3 that carry the bobbins 4 upon which the yarn is wound. Also mounted on the bar 1 is a whorl brake and locking lever 5. Means are provided for imparting rotation to the spindle and whorl assemblies 3, said means comprises a main drive shaft 6, suitably journaled in the main frame (not shown) of the ring twisting machine, and a drive pulley 7 fixed to said shaft, the pulley 7 being operatively connected to the spindle and whorl assemblies by means of a belt 8 which travels over a guide roller 9, as is well understood in the art.

At intervals in the bar 1 are guide-ways 11 in which supporting posts 12 are adapted to reciprocate. The posts 12 support a traverse bar 13 in which are mounted rings 14 carrying a traveler (not shown) for inserting twist in the yarn and for directing the yarn on to the bobbin 4. The posts 12 may be provided with a wear plate 15 that rests on or is fastened to a roller 16 mounted on a lever arm 17 provided at its opposite end with a counterweight 18. At least one of the lever arms 17 has suitably attached thereto at a point intermediate its ends an arm 19, the purpose of which will hereinafter be described. The lever arm 17 is journaled on a shaft 21 suitably supported on the main frame. Ordinarily there are twenty-four such counterweighted lever arms 17 on each 180-spindle ring

twisting machine, the counterweights 18 being 50 pounds each. In the reciprocation of the traverse bar 13, the raising thereof is effected by the counterweighted lever arms, while the lowering of the same is accomplished by a positively driven heart-shaped cam 22. The cam 22, which is mounted for rotation on a shaft 23 driven from a gear box 24 operated by the main drive of the machine, cooperates with a cam follower 25 rotatably mounted in a recess 26 provided in a builder arm 27. Builder arm 27 is pivotally mounted at one end on a stationary shaft 28, the other end thereof being provided with creeper gear attachment generally indicated by reference numeral 30.

As indicated above, the constant traverse stroke employed in prior ring twisters made for poorly wound packages. To avoid this difficulty, there is provided the creeper gear attachment which is adapted to continuously vary the wind on the take-up bobbin by a step-by-step change in the stroke effected by the usual builder arm. For instance, on prior standard set-ups the traverse stroke was constant and was set to travel the full length of the bobbin barrel, normally about $8\frac{7}{16}$ inches, whereas in the present case where a creeper gear attachment is employed, the constant stroke is set to travel $8\frac{1}{4}$ inches, or $\frac{3}{16}$ of an inch shorter than the bobbin barrel, with the superimposed stroke effected by the creeper gear making up the difference of the $\frac{3}{16}$ of an inch. Consequently, slight variations in bobbin traverse length do not show up when the wind is broken up at either end of the stroke. A further advantage is obtained in that the slight continual variation in pitch of the traverse produces a more firm package.

The creeper gear attachment 30 mounted on the shaft 29 at the end of the builder arm 27 will now be described in detail. On the shaft 29 is mounted a bushing 31 which supports a pivoted ratchet arm 32 having a counterweight 33 fixed at one end and a rod 34 pivotally attached to the other end. The rod 34 is provided with two adjustable collars 35 and 36 so spaced as to be on opposite sides of an abutment plate 37 through which the rod 34 passes. The abutment plate 37 is attached to the main frame 1 in a suitable manner as indicated at 38. The collars 35 and 36 acting against the abutment plate 37 effect a movement of the ratchet arm 32 relative to the builder arm 27. Mounted on the ratchet arm 32 is a pawl 39 held by a spring 41 against a ratchet wheel 42. The hub of the ratchet wheel 42 extends laterally of the shaft 29 and is formed into an eccentric bearing 43 on which is journaled a hub 44 having an integral extension or ear 45 to which the traverse drive chain 46 is attached.

In operation, the builder arm 27 is reciprocated by the cam 22 in a constant arc thus imparting a pull and release of a definite length or set on the traverse drive chain 46. This motion normally would produce a constant repeat of the traverse of the yarn on the package, the pitch of the traverse on any portion of the package being constant and governed by the shape of the cam 22. However, superimposed upon this constant movement by the cam 22 is the continual variation in a step by step advance and return of the set of the traverse effected by the ratchet wheel 42 and eccentric bearing 43 combined to produce a creeper gear. Obviously the eccentric bearing can be made to have any suitable ratio between its major and minor axes to produce any desired length of creep. Also, the collars 35 and 36 may be spaced to throw the ratchet wheel 42 the distance of one or more teeth to vary the speed of the traverse creep. It has been found, for example, that a firm $8\frac{7}{16}$ inch package is formed by having the builder arm move the traverse $8\frac{1}{4}$ inches while the creeper gear provides a $\frac{3}{16}$ inch creep of the traverse.

The creeper gear arrangement described above may be incorporated in any ring twisting machine producing any type of package. It is, however, especially advantageous when incorporated in a ring twisting machine employed in producing a taper-top package. In accordance with our invention a taper-top package may be produced by incorporating in the traverse drive mechanism an eccentric idler pulley attachment. The object of this pulley is to cause the ring bar to accelerate its stroke when it rises to a predetermined position in relation to the package being built, and cause the ring bar to be deaccelerated on its downward stroke.

Means are provided for tapering the top portion only of the package. This means consists of an eccentric idler pulley for guiding the traverse lifting chain, thus making for a simple and inexpensive method of producing taper-top packages (5 inches straight traverse and 3½ inches taper traverse) for the purpose of increasing yarn capacity on bobbin and allowing additional "finger" clearance between the outer periphery of the bobbin flange and the yarn windings, thereby minimizing the danger of operatives soiling outer windings when handling full packages. The purpose of said means is to accelerate the ring rail when it rises to a predetermined position in relation to the package being built, the stroke being deaccelerated on its downward stroke. This motion is accomplished by modifying the normal builder chain and pulley construction. The means provided herein for forming the taper-top packages changes the ratio of the pulley so as to cause the chains connected thereto to be taken in and let out in an accelerated and deaccelerated manner until they reach a predetermined position on the pulleys, when they will act in the normal way. This complete motion is carried out with every revolution of cam 22 above described.

More specifically, the mechanism for producing the taper-top packages is interposed between the builder arm 27 and the lever arm 17 and includes an arrangement of idler pulleys. An idler pulley 47 is suitably journaled at 48 in a bracket 49 attached to the main frame 1. The traverse drive chain 46 passes over the idler pulley 47 and is attached to an idler pulley 51 that is formed integral with or is attached concentrically to an idler pulley 52 that has a radial projection 53, extending therefrom, to the end of which a traverse builder chain 54 is attached. The other end of the chain 54 is attached to the working arm 19 of the lever 17. A flat spot 55 is machined on the periphery of idler pulley 51. The flat spot 55 on pulley 51 and the projection 53 on the pulley 52 change the ratio of the movement of the chains 46 and 54 causing them to accelerate and deaccelerate during a part of their movement and to operate at a constant ratio the rest of their movement in each cycle. This complete cycle or set of motions is carried out at every revolution of the cam 22.

The above described traverse drive produces a package like that shown in solid lines in Figure

4. In building this package the traverse of yarn on the package is substantially uniform on the up and down stroke over the section A but increased on the up stroke over the section B and retarded or decreased on the down stroke over the section B. The traverse is set to build a package having the length of section A plus section B minus the length of section C which section may be from 1/30 to 1/50, preferably about 1/45, of the entire length of the package. The section C is filled with yarn due to the creep of the traverse effected through the eccentric 44. The package shown in dotted lines in Figure 4 is the normal build of packages which compared with the package shown in solid lines defines a zone D showing the extent of the increase in amount of yarn that may be placed on the package and this increased weight of yarn is placed on the package while building a package that has 40% less breakages in subsequent coning operations and greatly reduced waste yarn due to the additional clearance at the top of the bobbin. It is to be noted that in forming section A that chains 46 and 54 are working against the normal face of the pulleys 51 and 52, respectively, while in forming section B chain 46 is working against the reduced periphery of pulley 51 due to the flat spot 55 thereon while chain 54 is working in a greater arc than the normal periphery of pulley 52 due to the projection 53 thereon. Obviously section B can be made any suitable length relative to section A by varying the length of the flat spot 55 and/or the length of the projection 53. In practice it is found desirable to have section A about twice the length of section B. In longer, thinner packages this ratio may be increased.

Figure 5 illustrates graphically the build and internal structure of the yarn package, showing the position of the traverse rail with respect to the yarn package at any time during the stroke of said traverse rail. It will be noted that the yarn is applied at a uniform pitch while the traverse rail moves the distance A indicated by straight line 56. Thus, the speed of revolution of the package will determine the number of turns of yarn applied. It is obvious, therefore, that under all speeds of revolution of the package the building of the package over this section A will produce a cylinder of yarn of uniform thickness. The curved line 57 indicates that the traverse rail accelerates over the distance B minus C, while the curved line 58 indicates that the traverse rail decelerates on the down-stroke over the distance B minus C. Thus, the build on this portion of the package will be in the nature of a frustrum of a cone the wall of which gets thinner as the top of the package is approached.

The reference numeral 61 indicates the upper extremity of one stroke of the traverse rail, the reference numeral 62 indicates the upper extremity of another stroke of the traverse rail, and the reference numeral 63 indicates the uppermost point which is reached by the traverse rail. These differences in upper extremities of the strokes are effected by a step-by-step creep of the traverse rail, the reference numeral 64 indicating a return of the stroke during the step-by-step creep. This cycle is repeated from ten to hundreds of times in building a package, the number depending upon the type of yarn and the purpose for which the package is being built. In building a 1½ pound package of 150 denier artificial yarn the traverse rail will make thousands of complete strokes and the step-by-step creep cycle will be repeated a much smaller number of times.

It is to be understood that the foregoing detailed description and drawings are given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

Having described our invention, what we desire to secure by Letters Patent is:

1. A method of forming a package of yarn on a bobbin or spool by ring spinning, which comprises traversing the yarn at a constant pitch over a body section, traversing the yarn at a constantly increasing pitch over a taper section, said body section plus said taper section being substantially the length but not the full length of the spool or bobbin, traversing the yarn at a constantly decreasing pitch back over the said taper section, traversing the yarn at a constant pitch back over the body section to constitute a complete cycle, moving the traverse an increment of the difference between the length of a complete cycle and the length of the spool or bobbin and winding another cycle.

2. In a device for winding bobbins and the like, the combination with a ring twisting device having a traverse bar and a ring for directing yarn on to the bobbin, a builder arm for imparting motion to said traverse bar and a constant moving drive for oscillating said builder arm, of means including an idler pulley having a flat face thereon, for accelerating and de-accelerating the motion of said traverse bar, imparted thereto through said builder arm by said constant drive, as the yarn is applied to a section at one end of said bobbin, and means for continuously varying the wind on said bobbin by a step-by-step motion relative to the package being formed, said wind-varying means comprising a creeper gear arrangement mounted on said builder arm and including an eccentric bearing operatively connected to said idler pulley.

3. In a device for winding bobbins and the like, the combination with a ring twisting device having a traverse bar and a ring for directing yarn on to the bobbin, a builder arm for imparting motion to said traverse bar and a constant moving drive for oscillating said builder arm, of means, including an idler pulley having a flat face thereon, for accelerating and de-accelerating the motion of said traverse bar, imparted thereto through said builder arm by said constant drive, as the yarn is applied to a section at one end of said bobbin, and means for continuously varying the wind on said bobbin by a step-by-step motion relative to the package being formed, said wind-varying means comprising a ratchet wheel mounted on said builder arm, a hub integral with said ratchet wheel and forming an eccentric bearing, a second hub integral with said eccentric bearing, means operatively connecting said second hub with said idler pulley, and means for rotating said ratchet wheel upon movement of said builder arm.

4. In a device for winding bobbins and the like, the combination with a ring twisting device having a traverse bar and a ring for directing yarn on to the bobbin, a builder arm for imparting motion to said traverse bar and a constant moving drive for oscillating said builder arm, of means, including an idler pulley having a flat face thereon, for accelerating and de-accelerating the motion of said traverse bar, imparted thereto through said builder arm by said constant drive, as the yarn is applied to a section at

one end of said bobbin, and means for continuously varying the wind on said bobbin by a step-by-step motion relative to the package being formed, said wind-varying means comprising a ratchet wheel mounted on said builder arm, a hub integral with said ratchet wheel and forming an eccentric bearing, a second hub integral with said eccentric bearing, means operatively connecting said second hub with said idler pulley, and means including a ratchet arm having a pawl thereon for rotating said ratchet wheel upon movement of said builder arm.

5. In a device for winding bobbins and the like, the combination with a ring twisting device having a traverse bar and a ring for directing yarn on to the bobbin, a builder arm for imparting motion to said traverse bar and a constant moving drive for oscillating said builder arm, of means, including an idler pulley having a flat face thereon, for accelerating and de-accelerating the motion of said traverse bar, imparted thereto through said builder arm by said constant drive, as the yarn is applied to a section at one end of said bobbin, and means for continuously varying the wind on said bobbin by a step-by-step motion relative to the package being formed, said wind-varying means comprising a ratchet wheel mounted on said builder arm, a hub integral with said ratchet wheel and forming an eccentric bearing, a second hub integral with said eccentric bearing, means operatively connecting said second hub with said idler pulley, and means including a counterweighted ratchet arm having a spring-pressed pawl thereon for rotating said ratchet wheel upon movement of said builder arm.

6. In a device for winding bobbins and the like, the combination with a ring twisting device having a traverse bar and a ring for directing yarn on to the bobbin, a builder arm for imparting motion to said traverse bar and a constant moving drive for oscillating said builder arm, of means, including an idler pulley having a flat face thereon, for accelerating and de-accelerating the motion of said traverse bar, imparted thereto through said builder arm by said constant drive, as the yarn is applied to a section at one end of said bobbin, and means for continuously varying the wind on said bobbin by a step-by-step motion relative to the package being formed, said wind-varying means comprising a shaft carried in the free end of said builder arm, a ratchet wheel on said shaft, a hub integral with said ratchet wheel and forming an eccentric bearing, a second hub integral with said eccentric bearing, means operatively connecting said second hub with said idler pulley, and means for rotating said ratchet wheel upon movement of said builder arm, said latter means including a ratchet arm pivotally mounted on said ratchet wheel shaft, a pawl on said ratchet arm for cooperating with said ratchet wheel and a counterweight carried by said ratchet arm.

7. In a device for winding bobbins and the like, the combination with a ring twisting device having a traverse bar and a ring for directing yarn on to the bobbin, a builder arm for imparting motion to said traverse bar and a constant moving drive for oscillating said builder arm, of means, including an idler pulley having a flat face thereon, for accelerating and de-accelerating the motion of said traverse bar, imparted thereto through said builder arm by said constant drive, as the yarn is applied to a section at one end of said bobbin, and means for continuously varying the wind on said bobbin by a step-by-step motion relative to the package being formed, said wind-varying means comprising a shaft carried in the free end of said builder arm, a ratchet wheel on said shaft, a hub integral with said ratchet wheel and forming an eccentric bearing, a second hub integral with said eccentric bearing, means operatively connecting said second hub with said idler pulley, and means for rotating said ratchet wheel upon movement of said builder arm, said latter means including a ratchet arm pivotally mounted on said ratchet wheel shaft, a pawl on said ratchet arm for cooperating with said ratchet wheel, a counterweight at one end of said ratchet arm, a rod on the other end of said ratchet arm, and an abutment plate on the ring twisting device for limiting the movement of said rod whereby said rod causes the rotation of said ratchet wheel through said ratchet arm and pawl carried thereby.

8. In a device for winding bobbins and the like, the combination with a ring twister device having a traverse bar and a ring for directing yarn on to the bobbin, a builder arm for imparting motion to said traverse bar, and a constant moving drive for oscillating said builder arm, and means for accelerating and de-accelerating the motion of said traverse bar as the yarn is applied to a section at one end of said bobbin, said means comprising an idler pulley having a flat face thereon, a second idler pulley operatively joined to said first-mentioned idler pulley, a means comprising a creeper gear arrangement including an eccentric bearing operatively connected to one of said idler pulleys for continuously varying the wind on said bobbin by a step-by-step motion relative to the package being formed, and means for operatively connecting the other of said idler pulleys to the traverse bar operating means.

9. In a device for winding bobbins and the like, the combination with a ring twister device having a traverse bar and a ring for directing yarn on to the bobbin, a builder arm for imparting motion to said traverse bar, and a constant moving drive for oscillating said builder arm, and means for accelerating and de-accelerating the motion of said traverse bar as the yarn is applied to a section at one end of said bobbin, said means comprising an idler pulley having a flat face thereon, a second idler pulley having a projection thereon and operatively joined to said first-mentioned idler pulley and means comprising a creeper gear arrangement including an eccentric bearing operatively connected to said flat faced idler pulley for continuously varying the wind on said bobbin by a step-by-step motion relative to the package being formed, and means for operatively connecting the projection on the other of said idler pulleys to the traverse bar operating means.

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