March 24, 1942. E. J. ABBOTT 2,277,574

WINDING

Filed Feb. 10, 1940 2 Sheets-Sheet 1

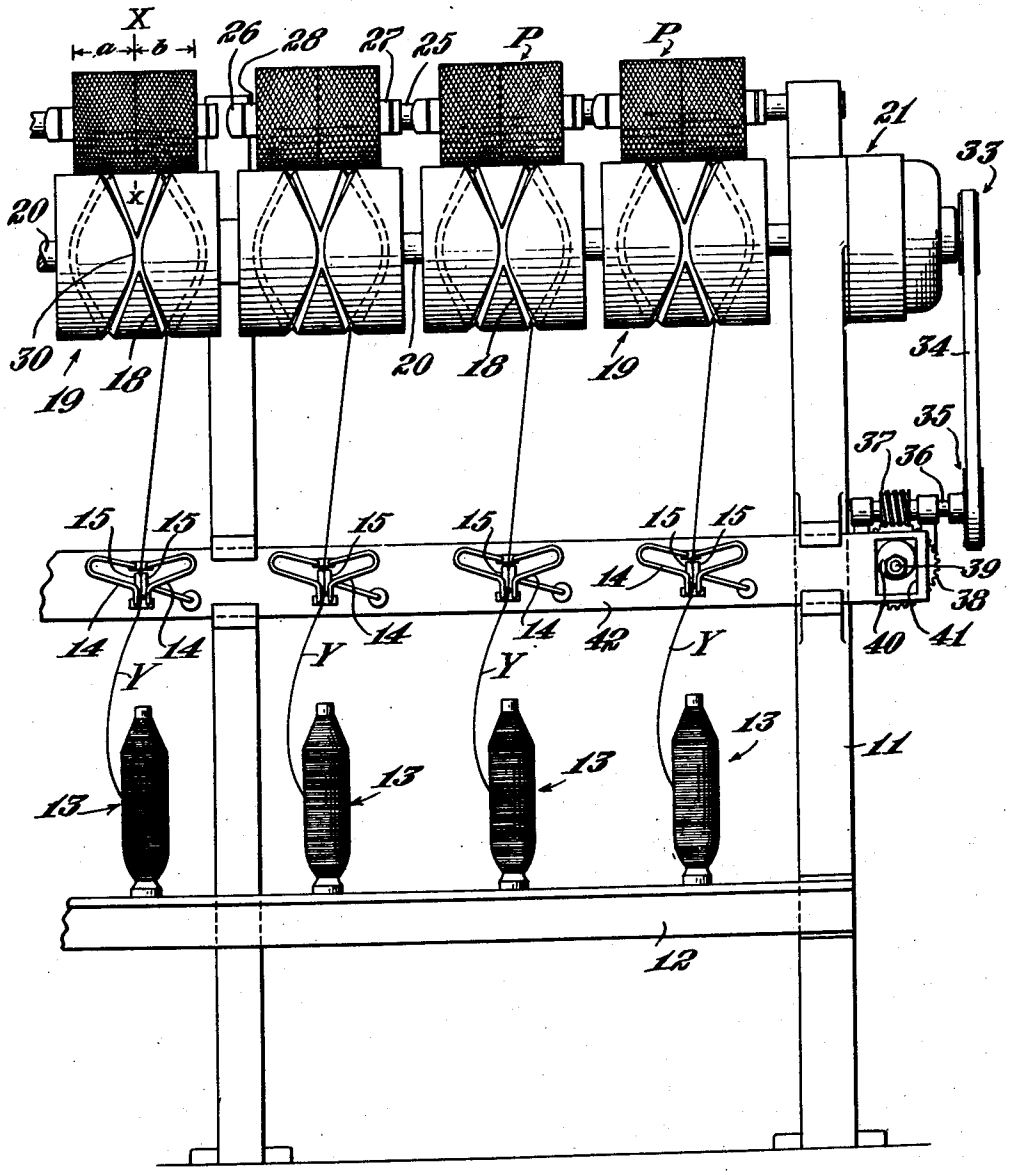


Fig. 1

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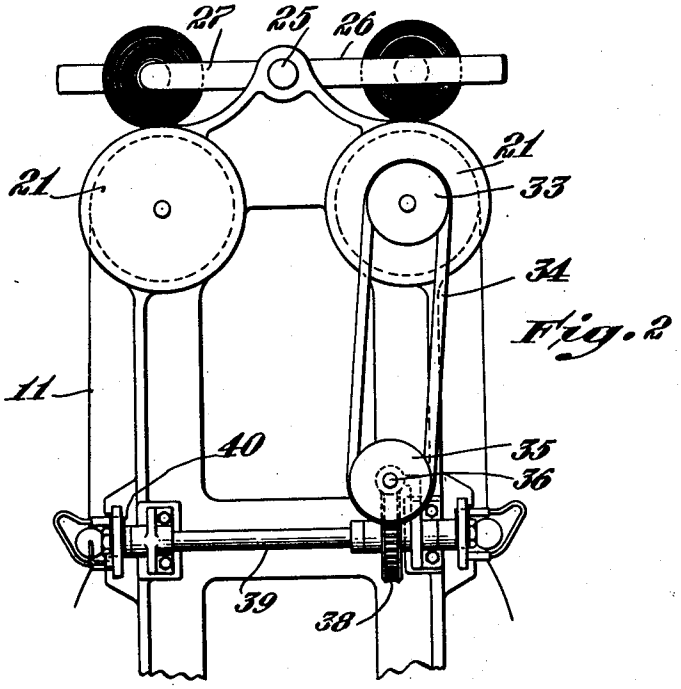


Fig. 2

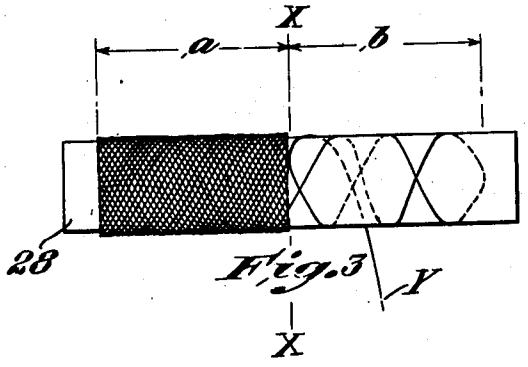


Fig. 3

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2,277,574

WINDING

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21 Claims. (Cl. 242—35.5)

This invention relates to an improved form of wound package and to a method and mechanism for winding it. Among the principal objects of the invention are to produce a wound yarn package having the general characteristics of the typical cross wound cheese or cone but from which the yarn is more easily unwound over the end of the package, and which is of greater capacity than the typical cheese or cone in that it has a greater density in the portion between the end faces.

Further objects of invention are to provide an improved method and improved apparatus for producing this new form of package of the invention; to provide a yarn package capable of production by a simplified form of winding machine; and to provide an improved form of winding machine in which rapid reciprocation of a traversing yarn guide is avoided.

Other objects of invention and features of utility will be apparent from this specification and its drawings wherein the invention is explained by way of example.

In the drawings:

Fig. 1 is a front elevation of a portion of a winding machine according to this invention, showing thereon a number of the new yarn packages of this invention;

Fig. 2 is a right end elevation of the upper portion of the winding machine of Fig. 1; and

Fig. 3 shows a winding package core having thereon a few turns of yarn as initially wound in forming the package of this invention.

Referring to Fig. 1, the winding machine frame indicated generally at 11 carries on lower rails 12 any suitable bobbin-holding devices for the unwinding supply bobbins 13. From bobbins 13 the yarn Y passes upwardly between wire yarn guides 14 and tension disks 15 (all of which can be substantially as shown in Fig. 1 of United States Patent No. 1,965,363), thence further upwardly and into the yarn winding groove 18 of a package driving roll 19, from whence it passes onto the surface of the winding package indicated at P.

The several package drive rolls 19 on one side of the machine are mounted on a common shaft 20 directly driven by an electric motor 21 at the end of the machine.

A central shaft 25 serves as a pivotal support for package-carrying arms 26, 27 which carry projections adapted to engage the centers of the opposite ends of the winding package cores 28. Package-carrying arms 26 are yieldingly urged toward the package core 28 by any suitable spring, and extend outwardly beyond the winding package core sufficiently to serve as a handle which can be shifted slightly to the left by the operator so as to disengage the winding package core.

In winding the new form of package the winding yarn is given approximately the same angle of traverse as in typical cross wound cones or cheeses, but in the great majority of strokes of traverse is traversed only through one part, for example, a half of the length of the package; then after a number of turns of cross winding in this manner, the yarn is shifted over onto the remainder of the length of the package and wound similarly, building up the package by winding fairly thin layers of cross wound yarn in these alternate zones until the whole package has reached the size of the common form of cheese or cone.

In the preferred illustrated form of the invention, the winding package drive roll 19 is of such diameter that its groove 18 makes two complete turns about the roll and accordingly crosses itself once. The groove 18 in effect constitutes two spiral groove portions, one occupying the portion of the drum corresponding to the left half of the winding package and the other occupying the portion of the drum corresponding to the right half of the winding package, these two groove portions abutting and merging at the crossing indicated at 30.

In producing the illustrated packages, the yarn is first traversed, in cross wound formation back and forth across one half (for example the left half) of the length of the exposed package during the time the package drive roll makes approximately thirty revolutions which results in winding on from about two hundred and fifty to about twenty wraps of yarn depending on the package diameter. As carried out by the illustrated machine, this method avoids any necessity for the yarn crossing over from the left to the right half of the groove 18 until for example two hundred and fifty to twenty wraps of yarn have been wound on the left half of the package. The yarn is then guided through the crossing into the right half of the groove 18 and an approximately equal number of wraps of yarn wound on the right half of the package whereupon the yarn is returned to the left half of the groove and this sequence continued until the package attains the required diameter.

Any necessity for any quick-acting yarn guide to carry the yarn across the crossing is thus avoided since the yarn needs to be returned through the crossing only once in about every

two hundred and fifty to twenty wraps, depending on the package diameter.

A preferred form of mechanism for shifting the yarn from one half of the groove to the other consists in a slow-moving mechanism for shifting the yarn guides 14 and tension devices 15 slightly to the left and right of a central position with respect to their package driving rolls 19. As shown in Figs. 1 and 2 one of the motors 21 which drives the drive roll shafts 20 is connected by a pulley 33, belt 34, pulley 35, shaft 36, worm 37, worm wheel 38 and shaft 39 to cams 40 which act in slots 41 of the rails 42 which support the yarn guides 14 and tension device 15. The gearing 33 to 40, inclusive has a ratio such that rail 42 is slowly shifted back and forth through a stroke of approximately one-half inch, making one such cycle of motion for every approximately sixty revolutions of the drums 19. As a consequence during approximately thirty revolutions of the drums 19 the yarn will be traversed by the left half of the groove 18 of the drums of Fig. 1, the yarn guides 14 and tension devices 15 being then in the left half of their slow cycle of reciprocation, whereupon shortly after these pass the vertical center between the unwinding bobbins and the drums 19 in going to the right, the yarn is led across the crossing 30 in the groove and thereupon is traversed by the right half of the groove during another approximately thirty revolutions of the drums 19.

Obviously within the scope of this invention many forms of mechanism can be employed to cause the yarn to be traversed with a quick-traverse through one part of the length of the package and then carried over onto the remainder of the length of the package, and so forth. Moreover, it will be apparent that where a grooved roll or drum is employed as the final agency to distribute the yarn on the winding package, the groove or drum does not need to have any special provision for carrying the yarn across the crossing in the groove, since this function is readily performed by a slowly moving element adapted to engage the yarn in advance of the grooved drum.

Fig. 3 shows the winding package core 28 in the condition in which it is found after the first group of say two hundred and fifty wraps of yarn have been wound in cross-wound formation in the left half zone *a* and winding begun in the right zone *b*; while Fig. 1 shows the packages as approximately half completed and having a definite boundary indicated at X—X between the two abutting halves of each package, this boundary X—X being demarked by reversals of spirals of yarn of the two abutting parts. It will be understood, however, that each of the two halves of the packages are tied together by the yarn which, from about every two hundred and fifty to about every twenty wraps, has been carried over from one half of the package to the other without reversal so as to extend in the form of a spiral substantially from one end of the package to the other. Thus the completed package is in no sense separable or even easily breakable at the boundary between its two halves. On the other hand, the package instead of having only two end faces which are defined and formed by the cusps of yarn at the reversals of the spiral windings, includes four such faces, the usual two at the ends of the package and two others in the middle at the boundary between the two halves.

Ordinarily a typical cheese or cone is considerably denser near its two end faces than in the middle portion. Yarn laid onto a rotating core or package with the necessary angle of traverse to make a cross-wound cheese or cone tends to draw in from the end portions of the package where its traverse is reversed and occupy a curve of from about two to three inches in radius, and the larger the diameter of the package, the less sharply the yarn can be laid at the end portions of the package for a given traverse ratio. The pressure at which the newly laid yarn is wound on the package somewhat squeezes it out toward the ends of the package thus producing fairly sharp cusps, but ordinarily the result of these several effects is that the yarn is somewhat more crowded together near the end faces of the package than in the middle portion and accordingly the package is denser near the end faces than in the middle. These effects tend to produce flanges near the two end faces of the package. In subjecting the package to the frictional driving effect of a roll in winding, or to the effect of an unwinding tractor roll such as employed in end-finding mechanism in United States Letters Patent No. 2,177,763 there is ordinarily a tendency for the package to be driven almost entirely by the yarn of these two flanges, so that wear and chafing of the yarn occurs at these places.

On the other hand, the effect of winding the package in the novel form of this invention is to produce a region in the middle of the package where the yarn has the same density and the same tendency to form flanges as at the two ends, thus not only increasing the capacity of the package but giving it a larger effective surface of contact with the drive roll in the case of winding or with the unwinding tractor roll in the case of end-winding.

In addition, the yarn is more satisfactorily unwound over the end of this novel package than in the case of the usual cheese or cone. In unwinding from the typical cross wound package the yarn tends to spring out into a big balloon while leading from the base up toward the tip and so becomes slack and unwinds easily. Then, when the yarn is taken off towards the base of the package, the slack in the yarn is immediately drawn out and the tension in the yarn tends to wrap it around the surface of the package or pull it down toward the surface of the package and cause breakage. However, in unwinding from the package of the present invention, where the normal shift of the yarn up and down the package is only one-half of the height of the package, there is considerably less change in the yarn tension as the yarn runs up and down the package in unwinding, and consequently less danger of the yarn catching on the package and breaking.

It has previously been proposed to wind the typical cheese as distinguished from the improved package of this invention, by a traversing mechanism consisting of a roll having a crossed groove and a supplemental yarn guide contacting the yarn ahead of the roll and moving back and forth with the yarn to cause the yarn to go across the crossing in the groove each time the crossing was encountered by the yarn. Such prior proposed machines have necessarily involved imparting to the supplemental yarn guide the same number of traversing movements or picks as the traversing yarn itself. Thus to attain high speeds of winding, it would be necessary with such prior proposed machines, to operate the supplemental

yarn guide at high speed, and the speed at which such supplemental yarn guide could be run would limit the winding speed.

On the other hand, in the machine disclosed in the present application the supplemental yarn guide can be run at a very slow speed even when winding at a very high speed so that in this machine the speed of the supplemental yarn guide is not a limiting factor in the winding speed.

I claim:

1. A method of winding comprising distributing the same yarn in a plurality of layers of cross-wound formation on one part of the length of the package, then in a plurality of layers of cross-wound formation on the remainder of the length of the package, repeating this until the package attains the desired diameter.

2. A method of winding comprising distributing the same yarn in a plurality of layers of cross-wound formation on approximately one-half of the length of the package, then in a plurality of layers of cross-wound formation on the other approximately one-half of the length of the package, repeating this until the package attains the desired diameter.

3. A method of winding comprising distributing the same yarn in from about two hundred and fifty to about twenty wraps of cross-wound formation on one part of the length of the package, then in a similar number of wraps on the remainder of the length of the package, repeating this until the package attains the desired diameter.

4. A wound yarn package of the same yarn having a portion distributed in a plurality of layers of cross-wound formation on one part of the length of the package, then a portion distributed in a plurality of layers of cross-wound formation on the remainder of the length of the package, then a portion distributed in a plurality of layers of cross-wound formation on the first-mentioned part of the length of the package and so on in this order.

5. A wound yarn package of the same yarn having a portion distributed in a plurality of layers of cross-wound formation on approximately one-half of the length of the package, then a portion distributed in a plurality of layers of cross-wound formation on the remainder of the length of the package, then a portion distributed in a plurality of layers of cross-wound formation on the first-mentioned approximately one-half of the length of the package, and so on in this order.

6. A wound yarn package of the same yarn wound in cross-wound spirals, the package consisting of two abutting parts with a boundary therebetween demarked by reversals of the spirals of yarn of the two abutting parts, a relatively small proportion of the spirals continuing across said boundary without reversal, to provide a plurality of connections between the two parts of the package, said spirals which continue across the boundary without reversal being distributed substantially throughout the thickness of the package.

7. A wound yarn package of the same yarn wound in cross-wound spirals, the package consisting of two abutting parts with a boundary therebetween demarked by reversals of the spirals of yarn of the two abutting parts, a relatively small proportion of the spirals continuing across said boundary without reversal and extending substantially from end to end of the package to provide a plurality of connections between the two parts of the package, said spirals which continue across the boundary without reversal being distributed substantially throughout the thickness of the package.

8. A wound yarn package of the same yarn wound in cross-wound spirals, the package consisting of two abutting parts with a boundary therebetween demarked by reversals of the spirals of yarn of the two abutting parts, from one out of approximately two hundred and fifty to one out of approximately twenty of the spirals continuing across said boundary without reversal to provide a plurality of connections between the two parts of the package, said spirals which continue across the boundary without reversal being distributed substantially throughout the thickness of the package.

9. A wound yarn package of the same yarn wound in cross-wound spirals, the package consisting of two abutting parts each of approximately half the length of the package with a boundary therebetween demarked by reversals of the spirals of yarn of the two abutting parts, a relatively small proportion of the spirals continuing across said boundary without reversal to provide a plurality of connections between the two parts of the package, said spirals which continue across the boundary without reversal being distributed substantially throughout the thickness of the package.

10. A winding machine having therein means for distributing the winding yarn in a plurality of groups of layers of cross-wound formation on one part of the length of the package, means for distributing the same yarn in a plurality of groups of layers of cross-wound formation on the remainder of the length of the package, and means for causing the yarn to be acted on by said means separately in succession during the winding, whereby the groups are wound alternately by said distributing means.

11. A winding machine having therein means for distributing the winding yarn in a plurality of groups of layers of cross-wound formation on approximately one-half of the length of the package, means for distributing the same yarn in a plurality of groups of layers of cross-wound formation on the remainder of the length of the package, and means for causing the yarn to be acted on by said means separately in succession during the winding, whereby the groups are wound alternately by said distributing means.

12. A winding machine having therein two alternately effective traverse means, one of said traverse means being adapted to traverse the winding yarn in cross-wound spirals in one part of the length of the winding package, and the other of said traverse means being adapted to traverse the winding yarn in cross-wound spirals in the remaining part of the length of the package, and supplemental yarn guiding means operating periodically after the traversing of the yarn in a plurality of cross-wound spirals by one of said traverse means to transfer the winding yarn to the other of said traverse means.

13. A winding machine having therein two alternately effective traverse means, one of said traverse means being adapted to traverse the winding yarn in cross-wound spirals in approximately one-half of the length of the winding package, and the other of said traverse means being adapted to traverse the winding yarn in cross-wound spirals in the remaining part of the length of the package, and supplemental yarn-guiding means operating periodically after the

traversing of the yarn in a plurality of cross-wound spirals by one of said traverse means to transfer the winding yarn to the other of said traverse means.

14. A winding machine having therein a yarn traversing roll having thereon groove portions adapted respectively to traverse the winding yarn in cross-wound spirals on one part of the length of the winding package and in cross-wound spirals on the remaining part of the length of the package, and supplemental yarn guiding means operating periodically after the traversing of the yarn in a plurality of cross-wound spirals by one of said portions of the groove to guide the winding yarn to the other of said portions of the groove.

15. A winding machine having therein a yarn traversing roll having thereon groove portions adapted respectively to traverse the winding yarn in cross-wound spirals on approximately one half of the length of the winding package and in cross-wound spirals on the remaining part of the length of the package, and supplemental yarn guiding means operating periodically after the traversing of the yarn in a plurality of cross-wound spirals by one of said portions of the groove to guide the winding yarn to the other of said portions of the groove.

16. A winding machine having therein a yarn traversing grooved roll, the groove having one crossing, the portion of the groove on one side of the crossing being adapted to traverse the winding yarn in cross-wound spirals on one part of the length of the winding package, and the portion of the groove on the other side of the crossing being adapted to traverse the winding yarn in cross-wound spirals on the remaining part of the length of the package, and supplemental yarn-guiding means operating periodically after the traversing of the yarn in a plurality of cross-wound spirals by one of said portions of the groove to transfer the winding yarn to the other of said portions of the groove.

17. A winding machine having therein a yarn traversing grooved roll, the groove having one crossing, the portion of the groove on one side of the crossing being adapted to traverse the winding yarn in cross-wound spirals on approximately one-half of the length of the winding package, and the portion of the groove on the other side of the crossing being adapted to traverse the winding yarn in cross-wound spirals on the remaining part of the length of the package, and supplemental yarn-guiding means operating periodically after the traversing of the yarn in a plurality of cross-wound spirals by one of said portions of the groove to transfer the winding yarn to the other of said portions of the groove.

18. A winding machine having therein a plurality of yarn traversing rolls extending along the machine, each having thereon groove portions adapted respectively to traverse the winding yarn in cross-wound spirals on one part of the length of the winding package and in cross-wound spirals on the remaining part of the length of the package, a reciprocable member extending along the machine, yarn guides on said member positioned to guide the winding yarns in advance of said traversing rolls, and a connection between the traversing rolls and said reciprocable member imparting to said member and yarn guides a short relatively slow reciprocating motion adapted, periodically after the traversing of the yarn in a plurality of cross-wound spirals by one of said groove portions, to guide the yarn to the other of said groove portions.

19. A winding machine having therein means for distributing the winding yarn in a plurality of groups of layers of cross-wound formation on one part of the length of the package, means for distributing the same yarn in a plurality of groups of layers of cross-wound formation on the remainder of the length of the package, means for guiding the yarn to said distributing means successively and means for causing said guiding means to shift the yarn alternately from one distributing means to the other distributing means upon the completion of each group of layers.

20. A winding machine having therein means for distributing the winding yarn in a plurality of groups of layers of cross-wound formation on one part of the length of the package, means for distributing the same yarn in a plurality of groups of layers of cross-wound formation on the remainder of the length of the package, and means for successively guiding the yarn to one distributing means until a group of layers has been wound on one part of the length of the package and then to the other distributing means until a group of layers has been wound on the remainder of the package.

21. A winding machine having therein means for distributing the winding yarn in a plurality of groups of layers of cross-wound formation on one part of the length of the package, means for distributing the same yarn in a plurality of groups of layers of cross-wound formation on the remainder of the length of the package, means for guiding the yarn to said distributing means successively and means for causing said guiding means to shift the yarn from one distributing means to the other upon the completion of each group of layers.

EDWARD J. ABBOTT.