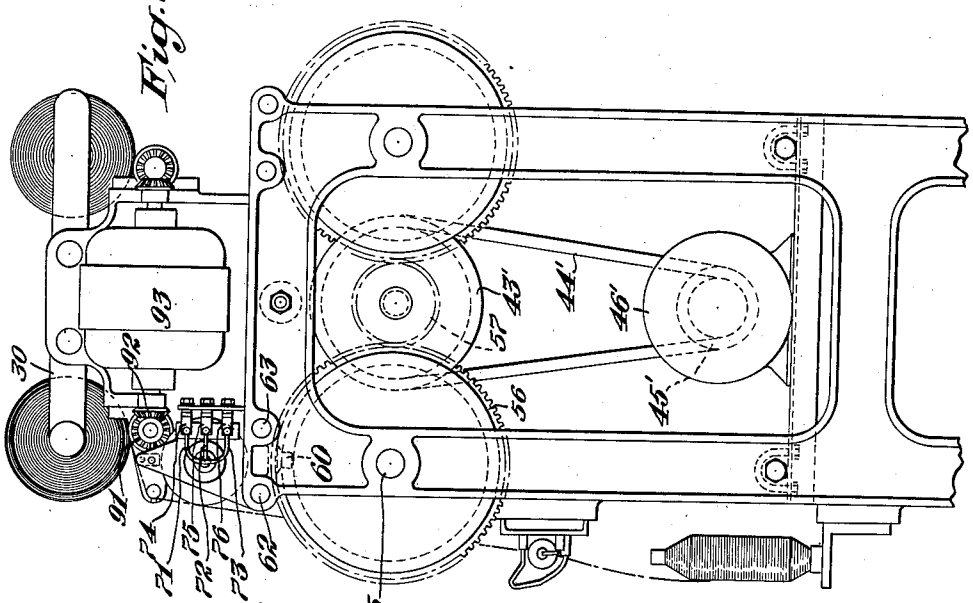
June 25, 1940. E. J. ABBOTT 2,205,384

WINDING

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Fig. 7.



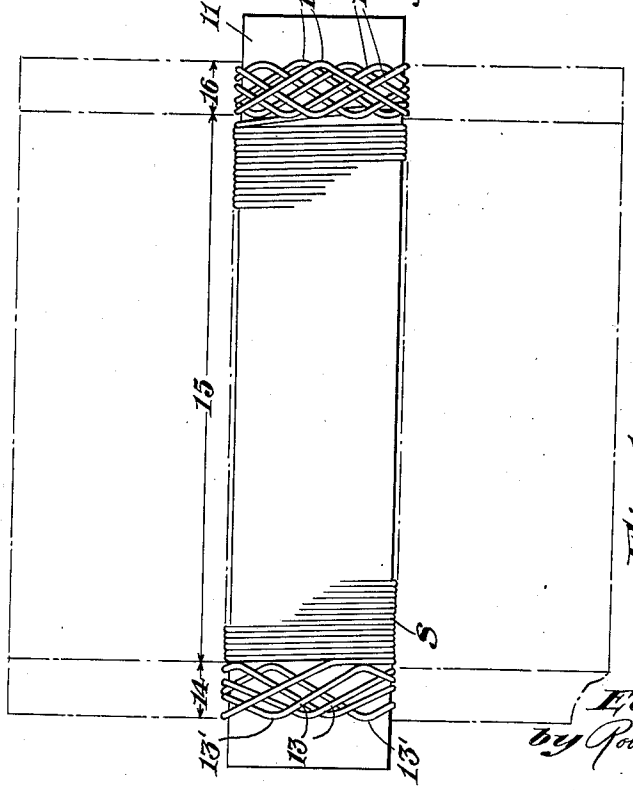
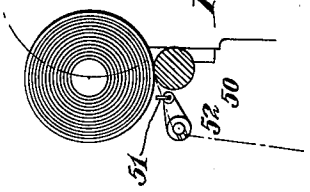


Fig. 1.

Fig. 8.



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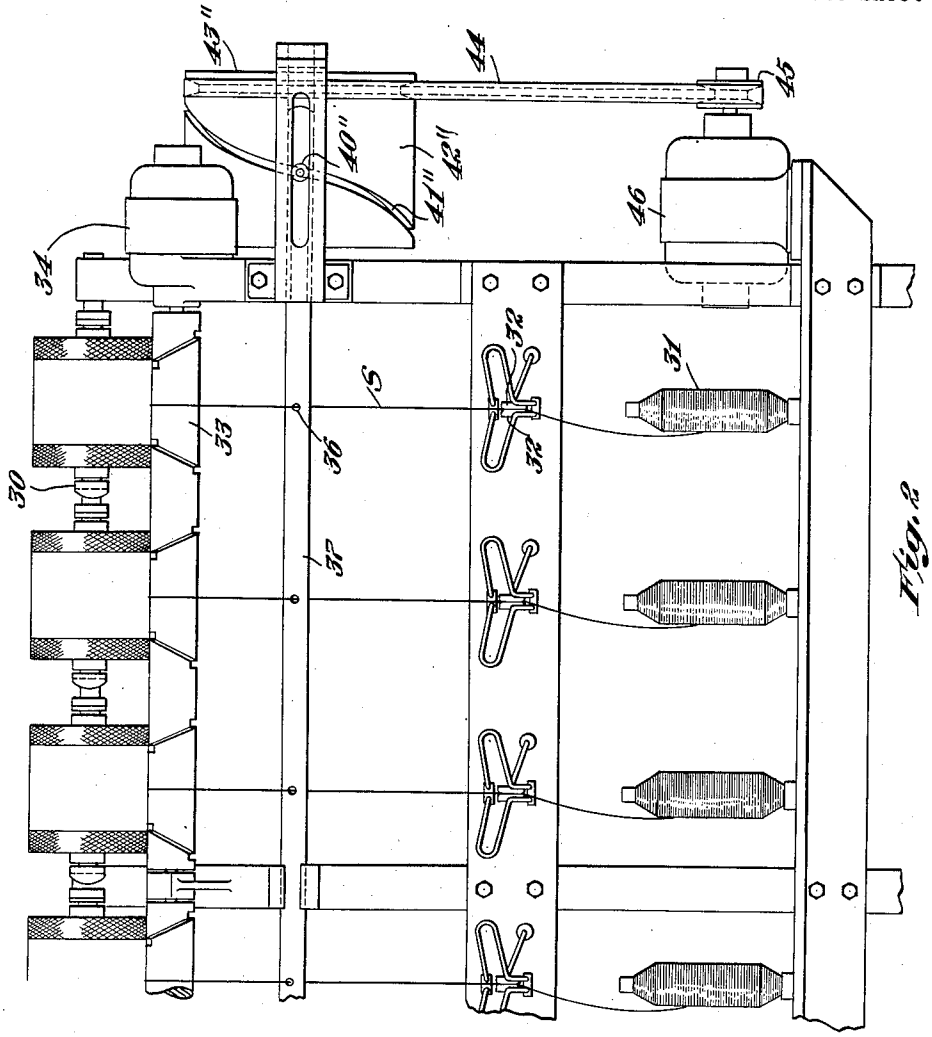


Fig. 2

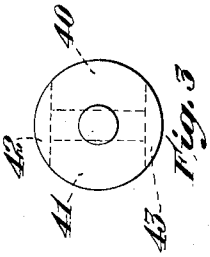


Fig. 3

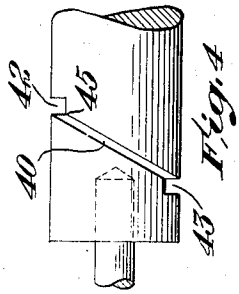


Fig. 4

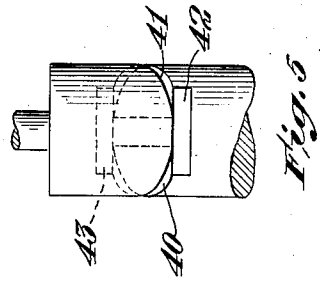


Fig. 5

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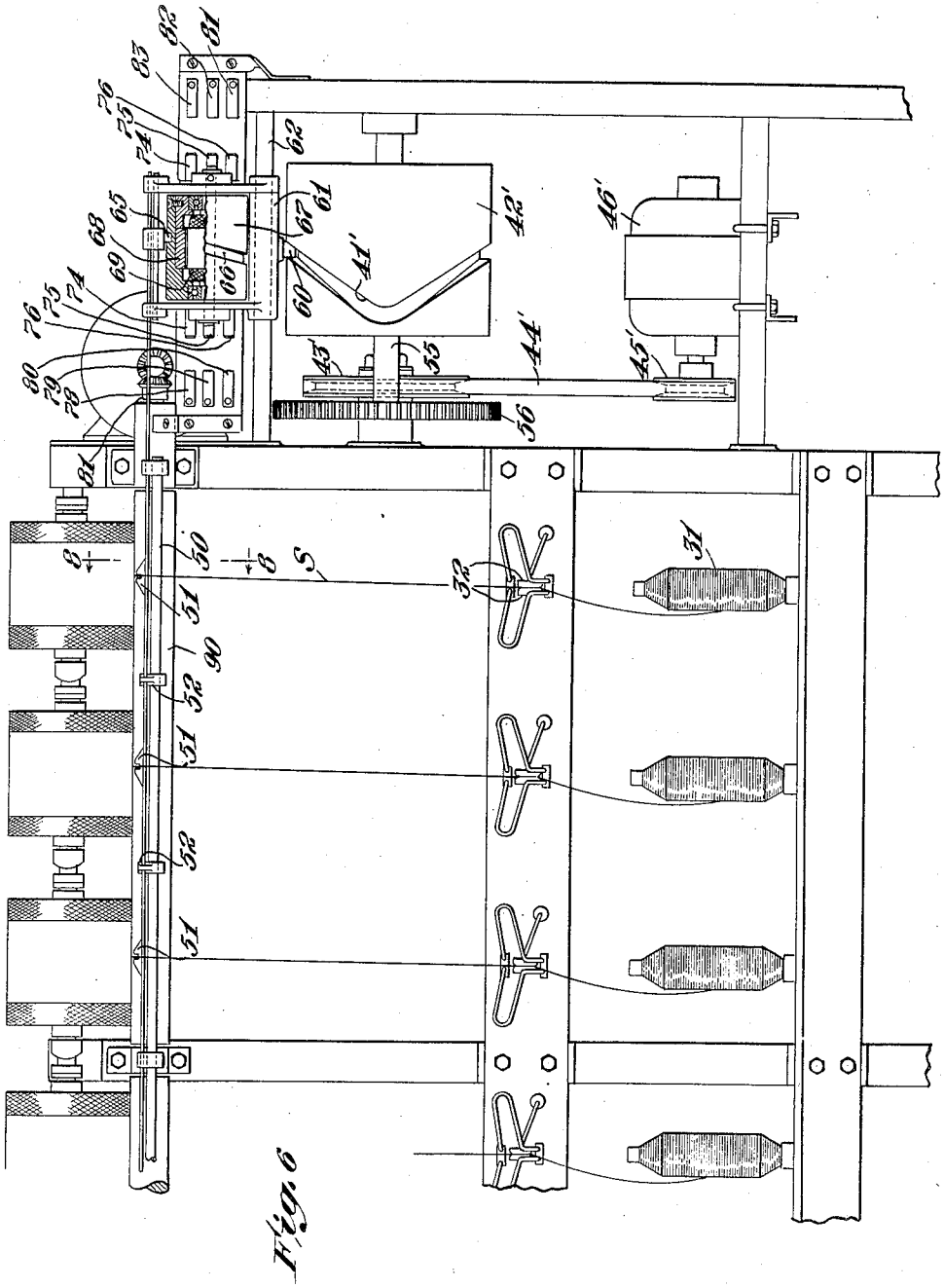


Fig. 6

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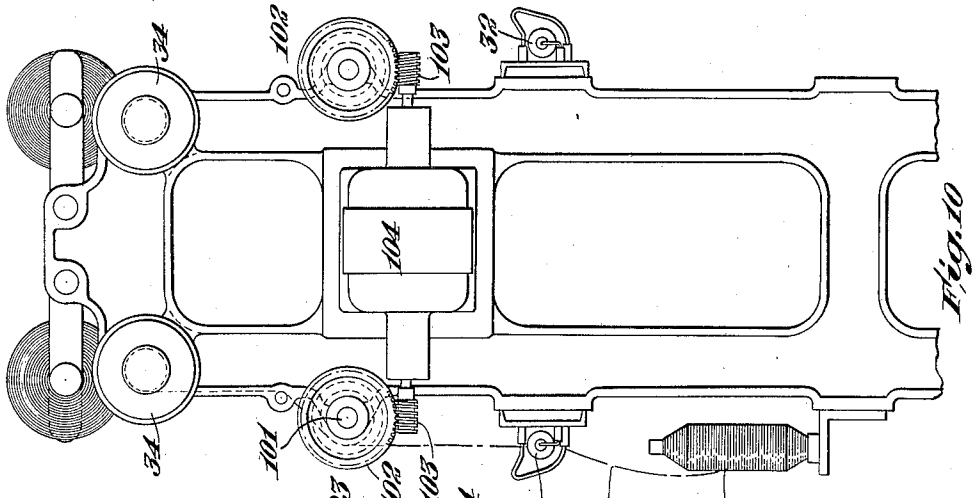


Fig. 10

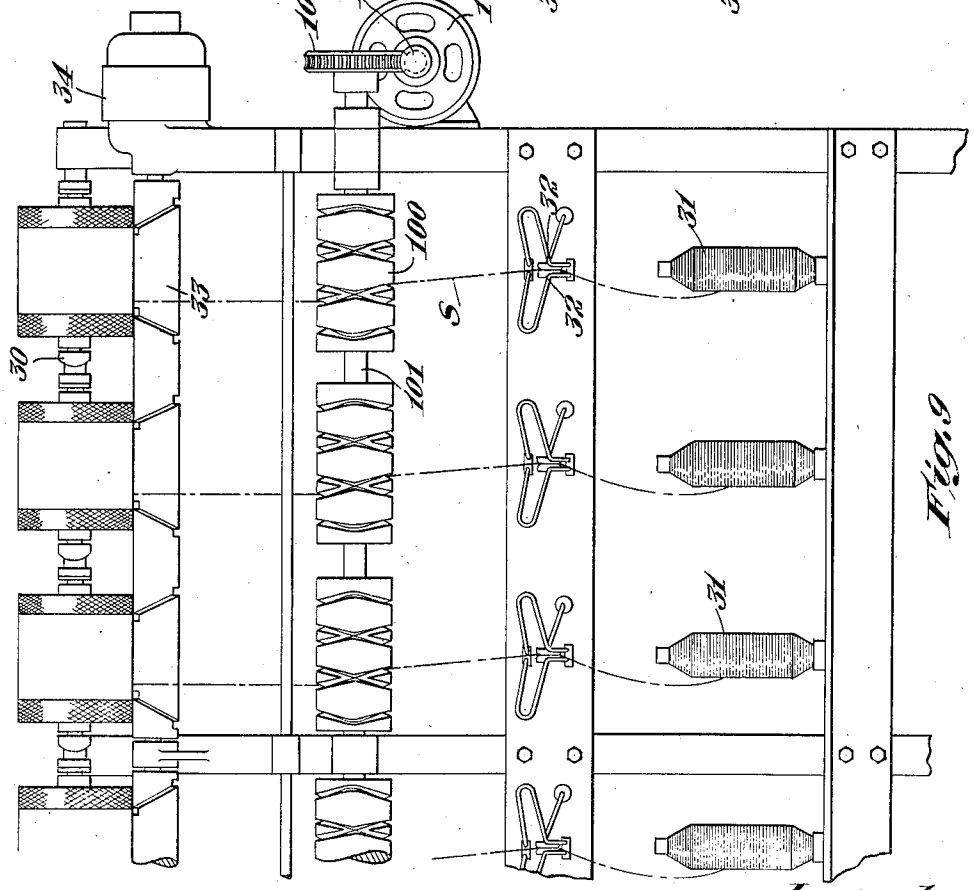


Fig. 9

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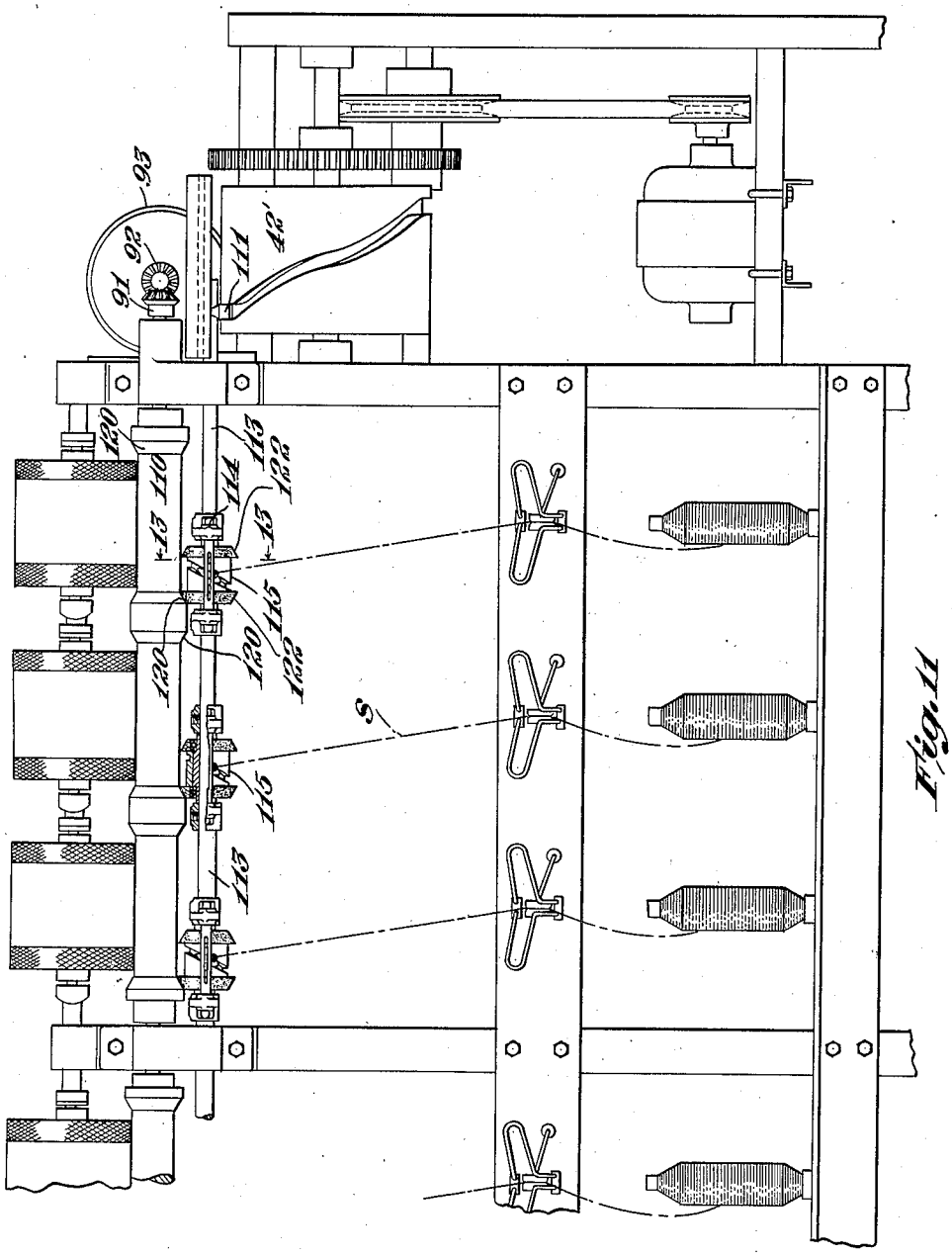


Fig. 11

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Fig. 13

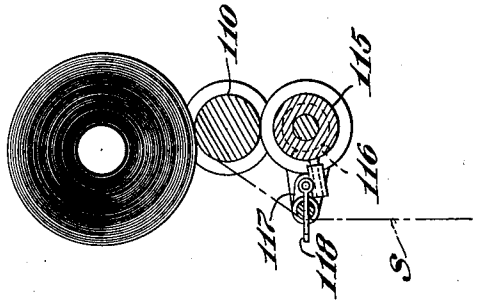
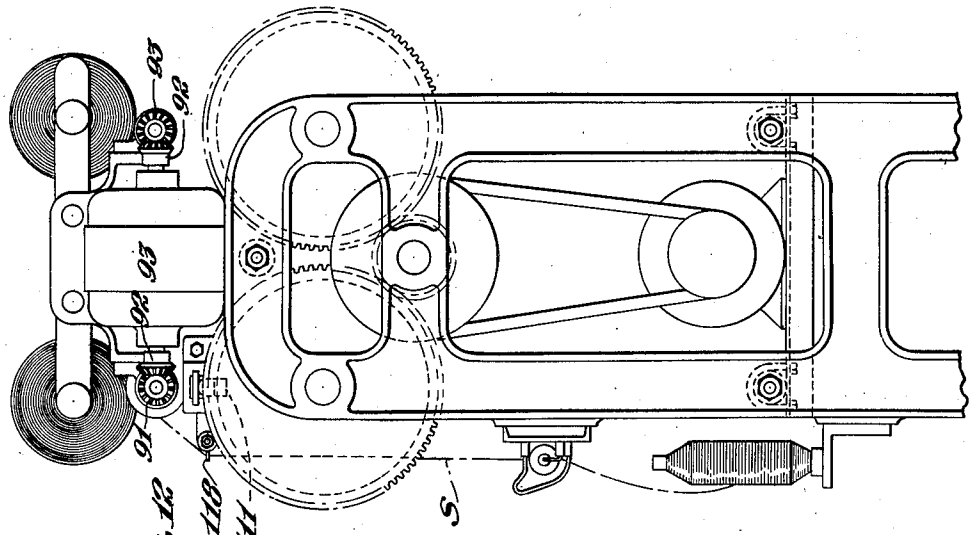


Fig. 12



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UNITED STATES PATENT OFFICE

2,205,384

WINDING

Edward J. Abbott, Wilton, N. H., assignor to Abbott Machine Company, Wilton, N. H., a corporation of New Hampshire

Application February 4, 1936, Serial No. 62,337

23 Claims. (Cl. 242—35.5)

This application is a continuation in part of the application of Edward J. Abbott for improvements in Winding, Serial No. 5,729, filed February 9, 1935, allowed December 7, 1935.

This invention relates to an improvement in wound packages of textile material, such for example as packages produced by spinning, twisting or winding machines, and to a method and mechanism for producing the improved packages. With each of these machines it is desirable that the package shall (1) be compact, and contain a maximum quantity of yarns, (2) without any lateral confinement such as the flanges of spools, but nevertheless free from a tendency to disintegrate in handling, (3) formed with a layer or pattern of yarn consistent with traverse speeds that can be practically maintained at high speeds of winding, and (4) well adapted for unwinding over-end. In the past, there have been certain inconsistencies between the attainment of optimum conditions of compactness, of self-sustaining characteristics and of high speed of winding.

Thus, the typical spool wound package is compact, and capable of being wound with various traverse devices which are well within their practical speed limits at high winding speeds, but suffers from the lack of self-sustaining structure, and is now practically limited to being wound on a flanged spool.

The typical filling wind, though satisfactory from the standpoints of self-sustaining character and ability of traverse mechanism, suffers from a loss of capacity due to its internal taper at one end, and external taper at its other end.

The typical cross-wound package, though self-sustaining, and capable of being wound on a simple cylindrical core, is less compact than a spool wound package of equal volume, and also in order to be self-sustaining, involves a rate of traverse of such high pitch as to limit the winding speed in many machines.

Also, all of these packages have certain limitations as to their ability to unwind when yarn is pulled off their over-end. The upper flange of a spool is liable to catch the unwinding yarn and cause a breakage. Many cross-wound and filling wound packages, on the other hand, suffer from the disadvantage that the point of departure of the yarn from the package shifts rapidly up and down and the length of the unwinding balloon is accordingly changed rapidly, this tending to cause unstability of the unwinding balloon.

The present invention has for its object to avoid the various defects or inherent disadvantages of these prior types of packages, to produce an improved type of package adapted to serve as a substitute for any of them, and to provide a method and mechanism adapted to wind the improved package.

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

In the drawings:

Fig. 1 shows the core of the package wound with the innermost convolutions which form the first substantially complete coverage of the core from end to end, and also shows in dotted lines the outline of the completed package;

Fig. 2 is a side elevation of a winding machine adapted for winding the package of Fig. 1;

Fig. 3 is an end elevation of the grooved yarn-guiding roll of the machine of Fig. 2;

Fig. 4 is an elevation of a portion of the roll of Fig. 3;

Fig. 5 is an elevation, taken at 90° to that of Fig. 4, of the same roll;

Fig. 6 is a side elevation of another winding machine adapted for winding the package of Fig. 1;

Fig. 7 is an end elevation of the machine of Fig. 6;

Fig. 8 is a vertical sectional view on the line 8—8 of Fig. 6, showing a detail of the traverse mechanism.

Fig. 9 is a side elevation of another winding machine adapted for winding the package of Fig. 1;

Fig. 10 is an end elevation of the machine of Fig. 9;

Fig. 11 is a side elevation of another winding machine adapted for winding the package of Fig. 1;

Fig. 12 is an end elevation of the machine of Fig. 11; and

Fig. 13 is a vertical sectional view on the line 13—13 of Fig. 11, showing a detail of the traverse mechanism.

The package core may be of any desired or usual construction suitable to be received in a winding, spinning, twisting doubling or other textile machine that produces a wound package, and is shown by way of example as comprising a simple cylindrical wooden tube 11. Although it is within the scope of my invention to employ a conical core, such expedient will generally not be necessary due to the ease of unwinding from

a cylindrical package built up as now to be described.

On the winding core 11, which may be surface driven or spindle driven as desired, there is first started an end of the strand of yarn S in any suitable manner, for example by making a few turns of the strand around the core, preferably adjacent to one end thereof. Or, if desired, the new strand to be wound can be united to an end of strand already associated with the core. Thereupon the full-speed rotation of the core is begun and the strand S traversed on the core in quick-pitch reversed spirals 13 within a zone 14 lying adjacent to one end of the core. These windings, at their points of reversal 13' define the extreme left end of the package to be formed. As indicated in Fig. 1, a number of these quick-pitch reversed spirals 13 are wound before alteration of the type of traversing of the yarn, the successive spirals each serving to bind the preceding spirals down. This zone 14 of quick-pitch winding preferably represents only a minor part of the length of the finished package, and in most instances may be approximately one-half inch in length.

After completion of the reverse spirals 13 of the zone 14, the yarn is then laid in the typical spool wind throughout a zone 15 representing nearly the whole length of the package. As is well known in the art, the pitch of traverse in this winding is only sufficient to lay each convolution of yarn beside the next preceding convolution, without any overlapping of successive convolutions.

At the end of the zone 15 of spool winding, the yarn is again traversed in a narrow zone 16 adjacent to the end of the core, in quick-pitch reversed spirals 17 similar to the spirals 13 in the zone 14 at the opposite end of the core. In Fig. 1, the points of reversal 17' of the spirals 17 are shown as defining the right end of the package to be formed.

Thereupon, the yarn is traversed across the zone 15 again from the zone 16 to the beginning of zone 14 in closely laid spool winding, whereupon a further series of reversed spirals are superposed on those previously laid in the end zone 14. The completed package, of which the outline is shown in dotted lines, is built up by a repetition of this sequence of operations. The number of revolutions of the package during which the strand is wound with a quick-pitch in zones 14 and 16 between each of the spool windings in zone 15 is preferably adjusted so that the growth of the package in these zones is in conformity with the growth of its main portion 15 so that the peripheral surface of the finished package has the form of a figure of revolution of a straight line, preferably a cylinder as shown.

As a result, the yarn of the package of Fig. 1, is mainly in the form of a closely wound spool, being largely composed of the completed zone 15 of spool winding of slight pitch.

Thus the largest portion of the yarn of the package is disposed in a most compact manner, and the capacity of the package is comparable to that of a typical flanged spool. The two ends of the package are in the form of thin disks, of for example one-half inch thickness, formed of the superposed series of reversed spiral windings 13 and 17 respectively. These end portions form self-sustaining ends for the package, preventing the large spool-wound bulk of the package from disintegrating. Viewed from either end, the package is practically the same in appearance as the usual cross-wound package or cheese.

From the preferred manner of winding described above, it will be apparent that in winding and unwinding the package, the self-sustaining end portions in zones 14 and 16 continually have substantially the diameter of the large central spool wound zone 15. Thus although the central spool-wound portion is continually held together by the self-sustaining end portions, which serve as heads or flanges therefor, the preferred manner of winding the package avoids having these heads or flanges substantially any larger than the central spool-wound portion either during winding or unwinding. Accordingly, during winding, the whole package may rest on or be pressed by a roll, and during unwinding the yarn may be pulled off over-end without interference by any overhanging head or flange such as customarily provided on textile spools.

It will moreover be apparent that the package of this invention avoids any necessity for traverse mechanism which will make a rapid complete stroke from one end of the package to the other, and the package can therefore be wound at a speed greater than that at which usual cross-winding machines can satisfactorily operate. Further, in unwinding the package over-end, there is at no stage in the unwinding any large quick change in height of the point of departure of the yarn from the vertically placed package. Obviously the package of this invention accordingly avoids any large quick changes in the length of the unwinding balloon.

One preferred embodiment of mechanism for winding the improved package of this invention is shown in Figs. 2 to 5, inclusive. Fig. 2 shows a winding machine having a plurality of winding units each including in known manner a pivoted holder 30 for the core of the winding package described above, a suitable supply bobbin 31, and tension disks 32, between which the winding strand S passes on its way from the bobbin to the winding package. The winding packages of the several units rest upon a rotary drive roll 33 which can be continuously driven in any suitable manner, as for example by an electric motor 34.

In this embodiment of the invention each winding strand is inserted in a guide hole or slot 36 in a continuously reciprocating traverse bar 37, which is mounted in suitable guides 38, 39 and carries a cam-follower pin 40'' extending into a cam slot 41'' of a cam 42''. Cam 42'' is shown as driven through a pulley 43'', belt 44'' and pulley 45 from a motor 46, the effect of this mechanism being to reciprocate the traverse bar 37 through a stroke almost as long as the length of the winding package and at a slow rate relative to the speed of drive roll 33, so as to traverse the winding strand at a rate productive of a spool-wound formation in the winding package.

The roll 33 conveniently serves as a further traversing element for the production of the desired quick-traverse portion of the winding on the packages. Referring to Figs. 3, 4 and 5, at each place on roll 33 at which a quick-traverse winding is to be produced on a winding package, the roll is provided with grooved strand-guiding surfaces which engage a strand delivered thereto by the bar 37 and lay the strand in quick-traverse formation until the strand is removed therefrom by the return movement of the slow-moving bar 37. In a roll 33 of approximately two

inches in diameter, these strand-guiding grooved surfaces can conveniently be made by cutting two grooves 40 and 41, approximately ⅛" wide into the roll from opposite sides and at the angle appropriate to the angle of traverse of the quick-traverse portion of winding, and then joining these grooves by other grooves 42, 43, approximately ¼" wide. In Fig. 4, the point 45 at the junction of grooves 40 and 42, is adapted to pick up the strand when it is delivered to this point by the slow motion of bar 37, whereupon, the aforesaid grooves in roll 33 traverse the strand at a fast rate through a short stroke, until return movement of the bar 37 removes the strand from the connecting groove 42. Quick traverse of the strand thereupon ceases, until the slow traverse of the strand delivers it to the similar grooves in roll 33 at the opposite end of the package. For the winding of a package of 6" length, the cam 42" which actuates the bar 37 is provided with a throw of approximately 5¾", an approximately even rate of progression, and fairly quick reversals at the ends of its throw.

In the mechanism shown in Figs. 6, 7 and 8, wherein similar parts are designated by reference characters corresponding to those used in Fig. 2, provision is made for employing a single reciprocating element 50 to carry strand guides 51 for imparting both the slow and the quick-traverse motions to a large number of winding strands in a multiple winding machine. In general it has not been desirable in practice to employ a long reciprocating element as the actuating member for imparting quick-traverse motion to strand guides of a multiple winding machine since the momentum of reciprocation has been so great as to prevent such mechanism from being run at high speeds. In the machine of Figs. 6, 7 and 8, this difficulty is overcome, and the traverse mechanism adapted to serve a large number of winding units in a machine of say 30 or more feet in length and operate at high speed, by making the long reciprocating element 50 in the form of a light steel wire, for example of one-eighth inch diameter and with a high degree of spring temper. The light wire 50 is preferably guided by small bearings 52, spaced at intervals, in which it slides with very little friction.

In this embodiment of the invention, a cam 42' having a cam groove 41' and mounted on a shaft 55 is driven through gears 56, 57, a pulley 43', belt 44' and pulley 45' from a motor 46' in a manner similar to that of the embodiment of Fig. 2. The cam groove 41' engages and operates a cam-follower 60, which is attached to a cross-head 61 sliding on guide rods 62, 63, with the result of imparting a slow reciprocating motion to the cross-head 61. The end portion of the light wire 50 is slidably mounted in the cross-head, and carries a cam-follower 65 engaging the quick-traverse groove 66 of a small cam 67, which is rotatably mounted in the cross-head. The cam 67 and cam-follower 65 thus constitute a connection between the slow speed cam 42' and the reciprocating wire 50, adapted to impart a slow-traversing motion to the wire 50 and its several strand guides 51.

In Fig. 6, the cam 67 is partially cut away to show a preferred form of mechanism for driving it to impart a quick reciprocation to the cam-follower 65 and wire 50. As indicated in that figure, the cam 67 is hollow and has attached to the inner surface of its shell a rotary electrical armature 68, adapted to be driven by the stationary field coils 69 of an electric motor of the inverted type, so as to rotate the cam. This motor, which is preferably of three-phase winding, is provided with connections 71, 72, 73, leading to contacts 74, 75 and 76, respectively, which are insulated from and carried by the cross-head 61, and extend from both ends thereof. Groups of stationary electrical contacts 78, 79, 80 and 81, 82, 83 connected to a suitable source of electricity are suitably mounted adjacent to the ends of the reciprocating movement of the cross-head 61, so that during the time in which the cross-head 61 is near the end of each stroke, the motor contacts 74, 75 and 76, touch either the group of contacts 78, 79, 80 or the group of contacts 81, 82, 83, and the motor field 69 is energized and the cam 67 thereby rotated to provide a rapid quick-traverse movement of the wire 50 and strand guides 51. During the main portion of the winding, however, the cam 67 is inactive since its motor is deenergized, and only the slow motion of the cross-head 61 is imparted to the wire 50, so as to produce the spool-wound formation of which the package is mainly composed.

In the embodiment of Figs. 6, 7 and 8, the packages are shown as rotated by contact with a plain drive roll 90, suitably driven by bevel gearing 91, 92 from a motor 93, although any other suitable mode of driving the packages can be employed.

In the modified form of machine of Figs. 9 and 10, the quick-traverse winding at the ends of the packages is accomplished by the roll 33 constructed and driven as in the machine of Figs. 2 to 5. The slow traverse of the strand 5 of each package is accomplished by the provision of rotary grooved rolls 100 mounted on a shaft 101 which is driven at a slow speed through a gear 102 and worm 103 from a motor 104. Any suitable form of grooved roll 100 may be employed, but it is preferred to employ a roll 100 having grooves such as described in United States Patent No. 1,749,355.

In the modified form of machine of Figs. 11 to 13, the winding packages rest on a drive roll 110 which is driven as in the machine of Figs. 6 and 7 by bevel gears 91, 92 from a motor 93. A slow motion cam 42', suitably driven in the same manner as in Fig. 6, operates a follower 111 which in turn slowly reciprocates a bar 113. On this bar are mounted brackets 114 in which there are rotatably mounted short quick-traverse cams 115. A cam follower 116 extends into the groove of cam 115 and is adapted to reciprocate a slider 117 having a slotted strand guide 118. In traversing the main body portion of the package, each cam 115 and its strand guide 118 is inactive and serves merely to impart the desired slow traverse to the strand 5.

Roll 110 is provided with tapered portions 120 outside of the region contacted by the winding package, and each quick-traverse cam 115 is provided with cooperating tapered tires 122 of cork or other friction material, with a result that when the cam 115 reaches either end of the package it is driven at a rapid rate by roll 110. The groove in cam 42' is provided with a slight dwell at each end of its stroke to provide for the driving of cam 115 by roll 110 to form the quick traverse winding at each end of the package.

In this specification and its claims, it will be understood that the term "strand" is intended to include a plurality of strands laid in parallel.

I claim:

1. A wound textile package comprised of the

same strand lying in a quick-traverse formation at the ends of the package and approximately perpendicular to the axis of the package in the intervening portion.

2. A wound textile package comprised of the same strand lying in a quick-traverse formation at an end portion of the package and approximately perpendicular to the axis of the package in the main body portion.

3. A wound textile package comprised of the same strand wound in layers of slight pitch, successive layers of the slight-pitch winding being connected at the ends of the package by quick-traverse windings having a plurality of back-and-forth traverses, the quick traverse windings forming self-sustaining ends of the package.

4. A wound textile package comprised of a strand wound in layers of slight pitch, successive layers of the slight-pitch winding being connected at the ends of the package by quick-traverse windings of the same strand having a plurality of back-and-forth traverses, the quick-traverse windings forming self-sustaining ends of the package, the peripheral surface of the package having the form of a figure of revolution of a straight line.

5. A wound textile package comprised of a strand wound in layers of slight pitch, the layers of the slight pitch winding being connected at the ends of the package by a larger number of layers of quick-traverse wound formation of the same strand.

6. A method of preparing a textile package comprising winding a strand in a spool wind and forming a self-sustaining end for the package by laying the same strand at said end of the package in quick traverse formation.

7. A method of preparing a textile package comprising winding a strand approximately perpendicular to the axis of the package and forming a self-sustaining end for the package by laying the same strand at said end of the package in quick-traverse formation.

8. A method of preparing a textile package comprising winding a strand in a spool wind and forming self-sustaining ends for the package by laying the same strand at both ends of the package in quick traverse formation.

9. A method of preparing a textile package comprising winding a strand approximately perpendicular to the axis of the package and forming self-sustaining ends for the package by laying the same strand at both ends of the package in quick-traverse formation.

10. A machine for preparing a wound textile package comprising means for winding a strand in a spool wind, and quick-traverse means for laying the same strand at an end of the package in quick-traverse formation.

11. A machine for preparing a wound textile package comprising means for rotating a winding strand package, traverse means having a slow motion and acting on the winding strand to distribute it in spool-wound formation, and quick-traverse means adapted to act on the same winding strand at the end portions only of the package.

12. A machine for preparing a wound textile package comprising means for rotating a winding strand package, traverse means having a slow motion and acting on the winding strand to distribute it in spool-wound formation, and a roll having quick-traverse, strand-guiding grooves positioned to pick up the same winding strand and lay it in quick-traverse formation at the ends only of the package.

13. A machine for preparing a wound textile package, comprising means for rotating a winding strand package, quick-traverse means for laying the winding strand in quick pitch layers of reversed spiral windings at two zones at the end portions of the package, thereby forming self-sustaining end faces, and means for traversing the same winding strand back and forth from one of said zones to the other, at a materially slower rate of traverse than in said zone, thereby to form the main body portion of the package.

14. A machine for preparing a wound textile package comprising means for rotating a winding strand package, traverse means having a slow motion and acting on the winding strand to distribute it in spool-wound formation, and constantly operating quick-traverse strand-guiding means operative to pick up the same winding strand only in relatively narrow zones at the end face portions of the package.

15. A machine for preparing a wound textile package comprising means for rotating a winding strand package, and two constantly running traverse elements engageable with the same winding strand, one in advance of the other, the traverse element which engages the strand nearer to the winding package being self-threading and having a shorter and faster throw than the other element.

16. A machine for preparing a wound textile package comprising means for rotating a winding strand package, a reciprocating strand guide, means for imparting a slow reciprocating movement to the strand guide such as to lay the winding strand in spool-wound formation, and means acting only when the strand guide occupies the end portions of its traverse stroke to impart to said guide a supplemental quick reciprocating movement.

17. A machine for preparing a wound textile package comprising means for rotating a winding strand package, a reciprocating strand guide, driving connections for the guide adapted to impart a slow reciprocating movement thereto, said driving connections including a normally idle cam and cam-follower adapted to impart a supplemental quick-traverse movement to the guide, and means for causing the cam to operate the follower to impart said supplemental quick-traverse movement only in end zones of the stroke of the strand guide.

18. A machine for preparing a wound textile package comprising means for rotating a winding strand package, a reciprocating strand guide, driving connections for the guide adapted to impart a slow reciprocating movement thereto, said driving connections including a normally idle cam and cam-follower adapted to impart a supplemental quick-traverse movement to the guide, a motor adapted to drive said cam, and means for energizing said motor to impart said supplemental quick-traverse movement only in end zones of the stroke of the strand guide.

19. A machine for preparing a wound textile package comprising means for rotating a winding strand package, a reciprocating strand guide, driving connections for the guide adapted to impart a slow reciprocating movement thereto, said driving connections including a normally idle cam and cam-follower adapted to impart a supplemental quick-traverse movement to the guide, a motor adapted to drive said cam, and actuated

as a consequence of switch means operated by the driving connection for the guide to energize said motor only in the end zones of the stroke of the strand guide to impart said supplemental quick-traverse movement only in end zones of the stroke of the strand guide.

20. A machine for preparing a wound textile package comprising means for rotating a winding strand package, a reciprocating strand guide, driving connections for the guide adapted to impart a slow reciprocating movement thereto, said driving connections including a motor-driven mechanism for imparting a supplemental quick-traversing movement to the guide, and means for actuating said motor-driven mechanism only in the end zones of the stroke of the strand guide.

21. A wound textile package comprised of the same strand lying in quick-traversed formation at an end portion of the package and in a slowly traversed formation in the main body portion of the package abutting said end portion, the quick-traversed strand in said end portion having reversals of traverse greater in number than the number of layers of the slowly traversed strand which abut said end portion.

22. A machine for preparing a wound textile package, the machine having therein a winding package drive roll, means for traversing the winding strand with a relatively slow traverse, quick-traverse mechanism adapted to impart a quick-traversing motion to the winding strand within a given zone of the package, said quick-traverse mechanism including driving means adapted to be stopped and started, and means for automatically stopping and starting the said quick-traverse driving means at intervals during operation of the winding package drive roll.

23. Method of preparing a wound textile strand package comprising rotating the winding package frictionally, traversing the winding strand with a relatively slow traverse, then subjecting the winding strand to the action of a quick-traverse mechanism in a relatively narrow zone at an end of the package, and traversing the strand with a relatively slow traverse in the main body portion of the package, stopping the quick-traverse mechanism while the strand is being traversed with the slow traversing motion in the main body portion.

EDWARD J. ABBOTT.

CERTIFICATE OF CORRECTION.

Patent No. 2,205,384. June 25, 1940.

EDWARD J. ABBOTT.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, line 75, and page 5, first column, line 1, claim 19, strike out the words "actuated as a consequence of"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 3rd day of September, A. D. 1940.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.