March 10, 1936. A. F. PYM 2,033,356

WINDING MACHINE

Filed Jan. 10, 1931 3 Sheets-Sheet 1

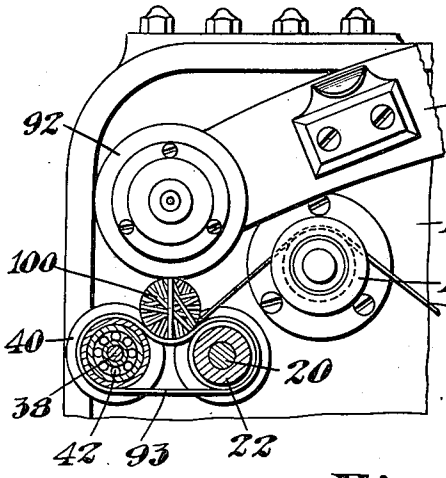



Fig.6.

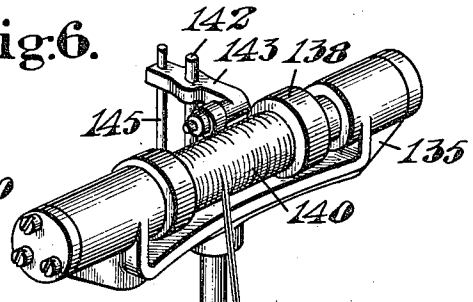
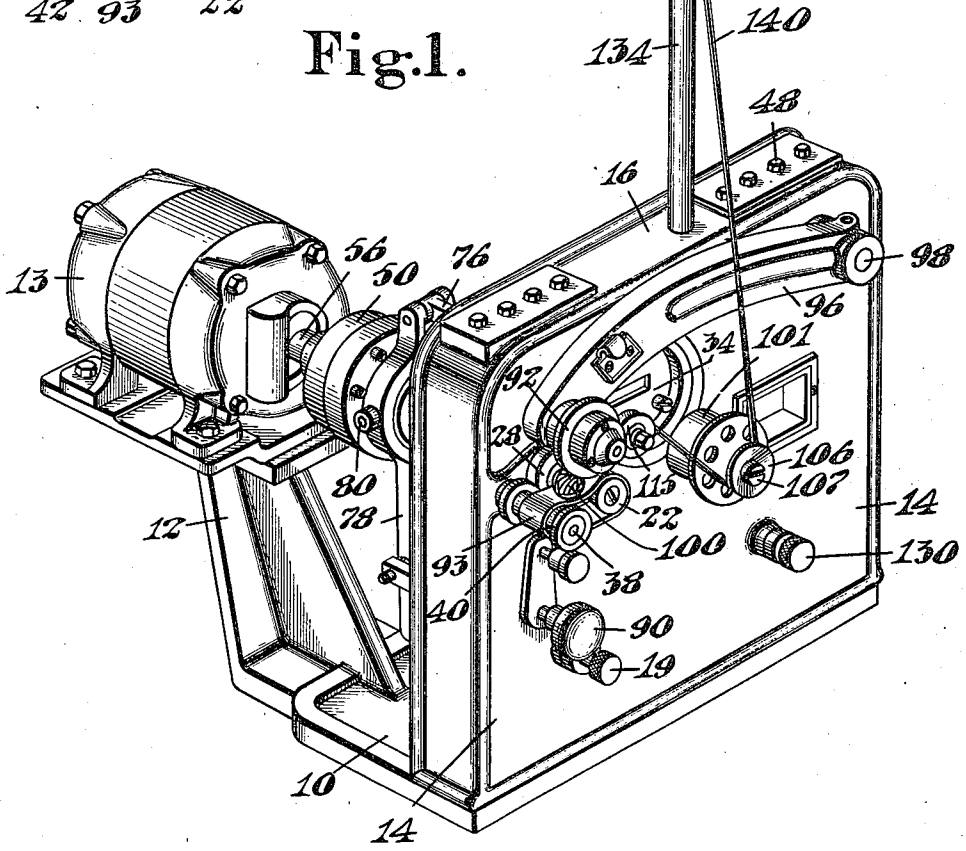



Fig.1.




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WINDING MACHINE

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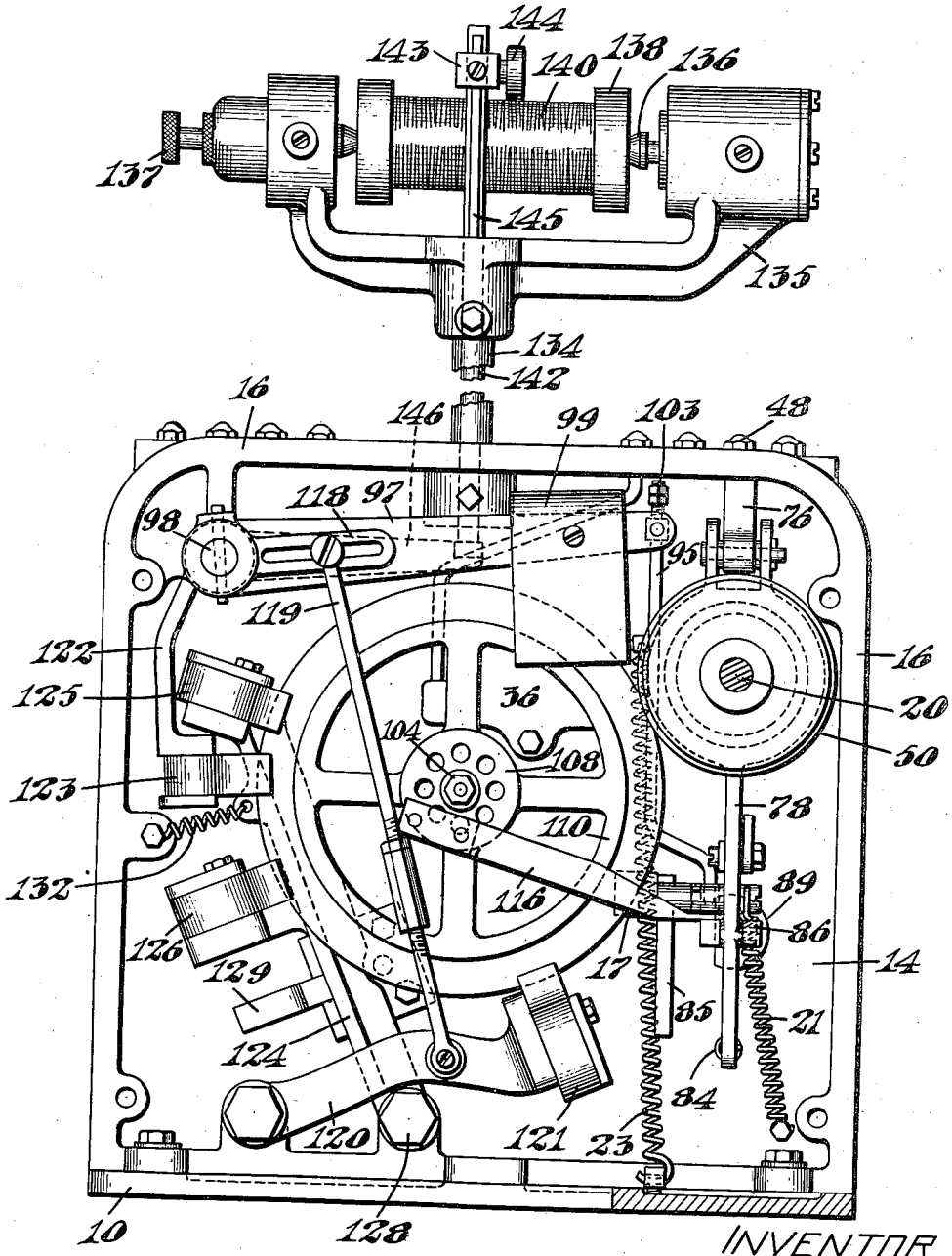



Fig. 2.

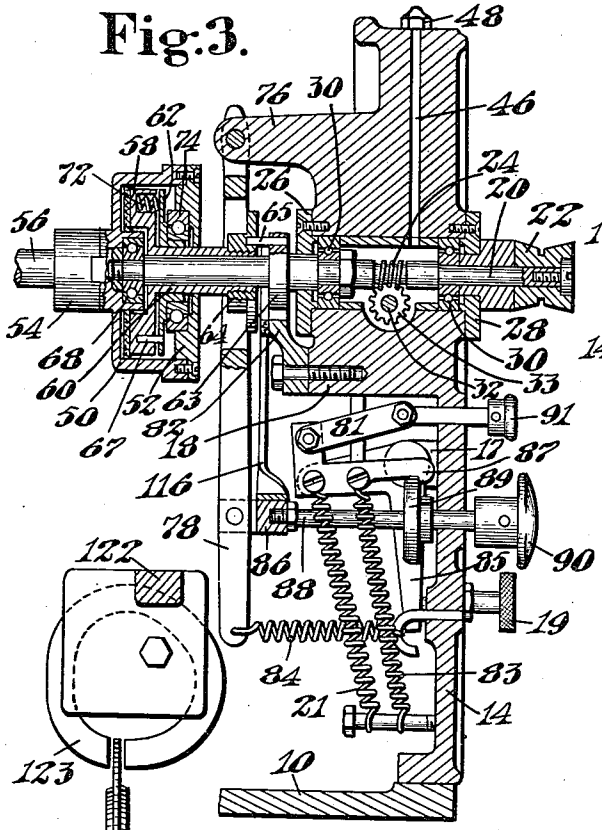
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March 10, 1936. A. F. PYM 2,033,356

WINDING MACHINE

Filed Jan. 10, 1931 3 Sheets-Sheet 3

Fig.3.



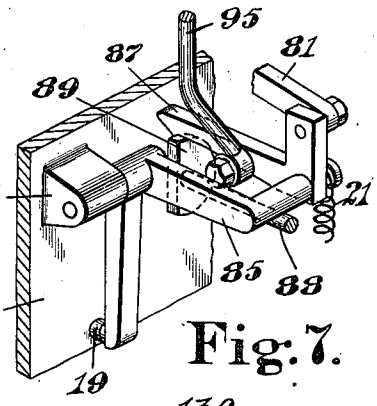




Fig.7.

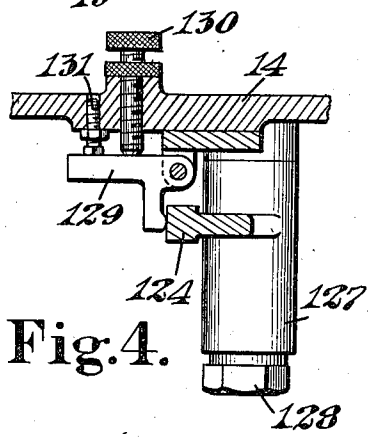



Fig.4.

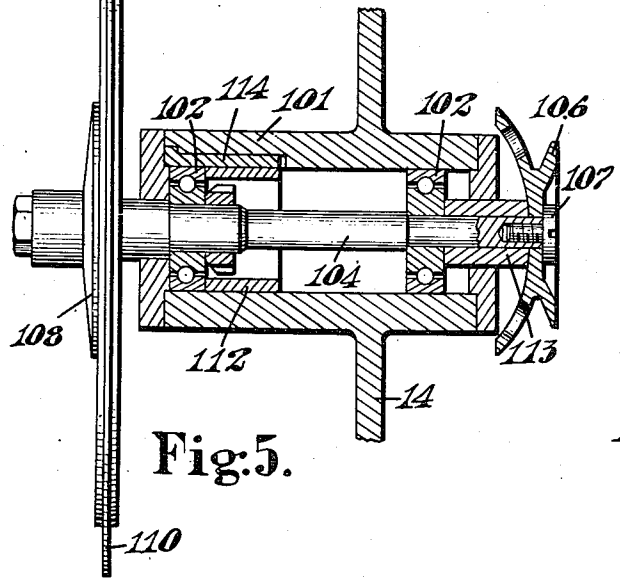



Fig.5.

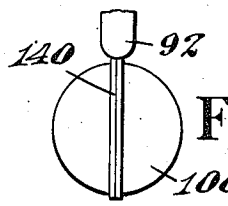



Fig.8.

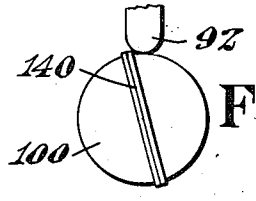



Fig.9.

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Patented Mar. 10, 1936 2,033,356

# UNITED STATES PATENT OFFICE

2,033,356

## WINDING MACHINE

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Application January 10, 1931, Serial No. 507,816

20 Claims. (Cl. 242—3)

This invention relates to machines for winding spherical cores such as those used in the construction of golf balls, and its object is to provide a winding machine by which cores may be wound with greater uniformity and accuracy of shape than heretofore and in an improved manner which prevents displacement of the kernel or center upon which the core is wound.

In the manufacture of golf balls it is customary to employ a small kernel, or center of pure rubber or an acid-filled and frozen kernel, and to wind upon this kernel a tensioned elastic thread, forming a spherical core of great resiliency. It is of the utmost importance to carry out the winding process symmetrically so that the kernel shall at all times occupy the geometric center of the core and to arrange the windings so as positively to prevent displacement of the kernel when the finished ball is subjected to the rough treatment incident to its use. If the kernel is displaced in winding or becomes displaced in use, the flight as well as the travel of the ball upon the green is rendered irregular.

In winding machines as heretofore constructed, the attempt has been made to rotate the core about axes predetermined in accordance with harmonic or other fixed type of mechanical movement but there are so many uncertain factors in the winding operation such, for example, as slippage of the core, and variations in the tension of the thread, that the results secured are not uniform and not always satisfactory, particularly in respect to the maintenance of a symmetrical position of the kernel in the core.

An important feature of my invention consists in controlling the rotation of the core automatically by the shape of the core as wound, as distinguished from the mechanical predetermination of its position heretofore attempted. Accordingly, in one aspect my invention comprises a machine having means for supporting and rotating a sphere, in combination with a thread guide and a novel means for detecting the zone of maximum diameter as the sphere is wound, and causing it to assume another position with respect to the thread guide. Having detected the zone of maximum diameter, the sphere is turned immediately to a position determined by a zone of undersize diameter therein. I have discovered that these results may be accomplished in a construction which includes an arm mounted to swing about an axis remote from the core to be wound and carrying at its free end a disk having a point contact with the core substantially in the plane of the thread guide, said disk being pressed yieldingly against the core as it is wound and tending to shift the core angularly in its support by reaction with any ridge, valley or other surface irregularity caused in the contour of the sphere by the windings thereon. This action being entirely automatic and depending directly upon the location of the turns of thread upon the core, is effective and certain to a degree which insures an accuracy, compactness and uniformity of product heretofore unavailable.

As herein shown, I employ a detector disk mounted for free rotation and having a convex rim arranged to run upon the surface of the driven core or sphere at a point disposed substantially in the winding zone. It will be apparent that in this manner a relatively unstable condition of equilibrium is established and with the disk thus mounted and yieldingly pressed the core being wound tends always to react against any surface irregularity and roll the core transversely with respect to the winding zone to present a fresh or undersize portion of its periphery in winding position.

In winding a core or ball of elastic thread, it is important that the core should be driven or rotated with adequate traction as well as delicacy and precision to secure the best results and this is conspicuously so in the case of balls of high quality which are wound of relatively fine elastic thread under substantial tension. This will be apparent when it is appreciated that in winding a single ball to produce the best results several hundred yards of elastic thread must be supplied at a tension not far from its breaking point and at an extremely high rate of speed. Any irregularity in the driving or rotating of the core will break the tension of the thread or reduce the tension of the windings so as to impair the resiliency of the product. The difficult problem of satisfactorily driving or rotating the core has been solved by my invention. I have discovered that the desired results may be produced by employing a driven flexible belt to support the core, that is, by cradling the core in a flexible belt supported at spaced points. Preferably and as herein shown, the belt is supported by a pair of spaced rolls and the detector member is located opposite to the space between the rolls and arranged to engage the core between itself and the belt. The core is thus supported throughout a considerable portion of its circumference, the wrap of the belt providing a non-slipping drive to the core which at the

same time is cushioned to such an extent as to avoid shocks or irregularities of movement.

In accordance with another important feature of the invention the flexible belt is so mounted that it has capacity for movement in a direction transverse to its line of travel so that the core being wound may be permitted to respond instantly to any change of direction imparted to it by the action of the detector member. As herein shown, the belt is supported upon rolls, one of which at least is of sufficient length to allow the belt to weave freely back and forth upon it in following the movement of the core.

It will be understood that the question of maintaining uniformly the proper degree of tension upon the thread supplied to the core presents also serious difficulties. These have been met in accordance with another feature of my invention which consists broadly in an electro-magnetic tension device. It is well known that in the movement of an electric conductor through a magnetic field eddy currents are induced in the conductor which tend to retard its movement. This principle has been employed in a wide variety of fields but never, so far as I am aware, in tension mechanism for controlling the passage of thread or elastic thread to a core or ball in winding the same. In the case of a machine such as that herein disclosed for handling a delicate elastic thread at relatively high tension, the smooth and yielding action of an electro-magnetic tension is extremely desirable. Another important advantage of my novel construction is that by its use the initial or starting retarding effect is reduced to a minimum and danger of breaking the thread thus minimized. In other words, in starting the winding operation there is no electro-magnetic drag upon the tension device so that the thread has only to overcome the inertia of the parts. It is only after the starting inertia has been overcome and the thread is in motion that the electro-magnetic drag of the tension device begins to become effective. Accordingly, I employ a rotary tension member arranged to be rotated at a speed proportional to the travel of the thread being wound and associate therewith a magnet so designed as to create an electro-magnetic retardation therein.

It is important that the degree of tension to which the thread is subjected should be capable of close and convenient regulation and this is effected in accordance with another feature of my invention by relatively adjusting the magnet and the rotary tension member so as to increase or decrease the electro-magnetic retardation developed therein. Such adjustment may be utilized either manually in determining the degree of initial tension in winding the core or automatically in accordance with the increasing diameter of the core, or in accordance with any other predetermined plan of variation. To this end preferably I employ a plurality of magnets in connection with the rotary tension member and provide manually adjustable means for moving one or more of the magnets with respect to the conductor and automatic mechanism for similarly moving another magnet or magnets in accordance with variations in the core diameter. This arrangement also permits the core to be started with a degree of tension in its thread initially determined by the operator and to have the thread tension progessively increased, for example, as the diameter of the core increases, the rate or magnitude of the increase being automatically controlled so that the final tension of the thread in the finished ball is again of the desired amount.

My invention also contemplates the provision of automatic mechanism of improved character for stopping the winding operation when the core has attained a predetermined diameter. This is accomplished, as herein shown, by utilizing the movement of the detector member to trip the stopping mechanism, thus deriving an additional function therefrom and contributing to the compact design of the machine.

My invention also includes new and improved mechanism for supporting the reel of elastic thread used by the machine in the winding operation and for controlling the tension of the thread from the reel, insuring smooth uniform delivery of the thread without over-running.

My invention includes many important features of mechanical design, arrangement and combination of parts, contributing to a compact, effective and smooth-running organization. The cooperative assembly of the elements above discussed in a unitary machine comprises an important aspect of the invention.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings, in which

Fig. 1 is a view in perspective of the machine;

Fig. 2 is a view of the machine in rear elevation;

Fig. 3 is a sectional view on a plane passing vertically through the main shaft of the machine;

Fig. 4 is a detail plan view, partly in section, of a portion of the manual tension adjusting mechanism;

Fig. 5 is a view, on an enlarged scale, of the tension mechanism partly in horizontal section;

Fig. 6 is a fragmentary plan view showing the core rotating and positioning devices;

Fig. 7 is a fragmentary view in perspective of the stop controlling mechanism; and

Figs. 8 and 9 are diagrammatic views illustrative of the action of the detector member in positioning the core.

The general operation of the detector member will first be described with reference to Figs. 8 and 9, it being understood that the core **100** being wound is supported upon the endless belt **93** and yieldingly engaged by the freely rotating disk **92**, as best shown in Fig. 6. The rim of the disk **92** is convex in cross section and engages the upper side of the core at a single predetermined point or very small area with an appreciable degree of pressure. The elastic thread **140** is represented as having been delivered to the core **100** in a series of turns forming a zone of greater diameter than that of the general curvature of the core. The rim of the disk **92**, on account of its location, engages and presses against this zone of maximum diameter and reacts against the rapidly rotating core so as to shift it laterally or to displace it transversely with respect to its normal plane of rotation. An unstable condition of equilibrium is thus created and the slightest relative displacement will cause the core to turn so as to carry the oversize zone away from the point of contact with the disk **92**. In other words, the narrow contact rim of the disk tracking upon the core in the winding plane detects the zone of maximum diameter in the core as it is wound and

tends to shift the core to carry that zone out of the winding plane. From another standpoint, it may be said that the disk 92 tends to find a zone of reduced diameter in the core and position the core with that zone in the winding plane. The core may be shifted by its reaction with the disk either about a horizontal axis lying in the winding zone or about a vertical axis, and in practice its shifting movement is a combination of the two. All this action is carried out at high speed as the core is rapidly rotated and the result is that a symmetrical core of accurate hemispherical shape is produced.

The machine is a complete motor-driven unit including broadly means for positioning and rotating the core to be wound, starting mechanism under the control of the operator which is tripped automatically when the core reaches a predetermined diameter, a reel of elastic thread with means for guiding it to the core being wound, electro-magnetic tension mechanism arranged to be adjusted or regulated in accordance with the requirements of the work initially and automatically during the winding operation, and a counter for indicating the revolutions of the machine or the number of balls wound.

The frame of the machine comprises a flat base plate 10 having a rearwardly and upwardly-inclined motor bracket 12 for the motor 13. Projecting vertically from the base plate is a panel 14 which carries certain moving parts of the machine and is provided with a peripheral flange 16. The panel 14 not only serves as a supporting frame but encases the friction-controlling mechanism and is designed to impart to the machine an attractive finish as a whole.

The panel 14 is provided upon its rear face with a horizontally-projecting integral boss 18 in which are formed bearings for the main shaft 20 of the machine. The shaft 20 carries at its forward end a roll or spool 22 which projects outwardly from the face of the panel 14 and constitutes the right-hand and driven roll of a horizontally-disposed pair. The left-hand roll 40 is mounted to rotate idly upon a stationary stud 38 projecting from the face of the panel 14 and is provided with ball bearings 42. Both rolls have surfaces which flare or diverge outwardly toward each end, thereby tending at all times to center the core under the disk 92.

The boss 18 contains an axially-extending chamber provided with a bushing and having fitted therein ball bearings 30 for the shaft 20. The ball races are retained in place by an inner collar 26 screwed to the end of the boss and an outer collar 28 screws to the face of the panel 14. A worm 24 is cut upon the shaft 20 between its bearings and this meshes with a worm gear 33 upon a transverse shaft 32 which is arranged to drive counter mechanism contained within a casing 36. This may be of any commercial type and is arranged behind a window 34 in the panel 14 through which the reading of the counter may be inspected. The drive to the counter may be so designed that the counter will show the number of revolutions made by the driven roll 22 or by a suitable reduction may indicate the number of cores or balls wound by the machine.

The driving connections between the motor 13 and the shaft 20, including the starting and stopping mechanism, will now be described. The motor shaft 56 is provided at its forward end with a flexible coupling 54, the inner member of which is formed as a part of a cylindrical clutch casing 50 so that the latter rotates with the motor shaft. The clutch casing is closed at its inner side by a face plate 52 through which projects the hub 60 of a longitudinally-movable friction disk 58. Upon its rear face the friction disk 58 is chambered to receive a hub extension of the clutch casing 50 which runs upon ball bearings 68 located upon the inner end of the shaft 20. A second set of ball bearings 74 is provided between the face plate 52 and the hub 60 of the friction disk and the result of this construction is that the casing 50 and its connected parts rotate freely and with a minimum friction upon the inner end of the shaft 20. A collar having a thin outwardly-extending flange 62 is secured in place upon the hub 60 and a series of compression springs 72 circumferentially spaced between the friction disk 58 and the flange 62 tend normally to separate these members and maintain the end face of the friction disk 58 in driving engagement with the inner face of the clutch casing 50. In Fig. 3 the clutch is shown in its disengaged condition. The friction disk 58 is maintained in non-rotative relation to the shaft 20 by connection with a collar 63 which is fast to the shaft 20 and provided with a pin 65 extending freely into a bore formed in a flanged collar 64 which is threaded upon the end of the hub 60 of the friction disk 58 and movable therewith as a unit. Also, a fixed angular relationship is maintained between the flange 62 and the friction disk 58 by means of a pin 67 set in the disk 58 and projecting through an aperture in the flange. It will be plain from the foregoing description that if the flanged collar 64 is moved toward the right it will carry with it the friction disk 58, compressing the spring 72 and disengaging the clutch.

The flanged collar 64 is arranged to be shifted to disengage the clutch by a shipper lever 78 pivotally mounted at its upper end upon a lug or rib 76 formed integral with the boss 18 and the panel 14. The shipper lever is yoke-shaped so that it embraces the collar 64 and is provided at diametrically opposite points with rollers 80, one of which is shown in Fig. 1, which make anti-friction contact with the flange of the collar 64. The shipper lever is normally swung toward the right, as seen in Fig. 3, by a tension spring 84 extending between its lower end and a hook projecting from the inner face of the panel 14. A block 86 is pivotally connected to the shipper lever near its lower end and this in turn is connected to a stem 88 extending outwardly through a bore in the panel 14 and provided at its outer end with a head or button 90. This constitutes the means by which the machine is started by the operator and when the head 90 is forced inwardly the shipper is swung in opposition to the spring 84, permitting the flanged disk 64 and its associated parts to move toward the left under the actuation of the spring 72 to engage the clutch.

The stem 88 is provided with a flanged collar 89 with which cooperates a latch piece 87 pivotally mounted upon an angular supporting lever 85. The latch piece 87 is normally retained in latch engagement by a tension spring 83 extending between it and a pin set in the lower part of the panel 14. The latch is in shape a bell crank lever having its short arm extending upwardly from its fulcrum point and connected through a link 81 to a plunger having a button 91 upon its outer end disposed in close proximity to the starting head 90 and above the same.

By pushing inwardly the button 91 the latch 87 is lifted, disengaging the flanged collar 89 and permitting the spring 84 to throw the shipper lever 78 toward the right, thus disengaging the clutch and bringing the machine to rest. Prompt stopping of the machine is insured by a forked brake member 82 which is secured to the inner face of the boss 18 in position to be engaged by the flanged collar 64 when the latter is moved to its clutch-disengaging position. It will be understood from the foregoing description that the spring 84, operating through a long lever arm, is sufficiently powerful in its action to overcome the action of the springs 72 which have no mechanical advantage. It will further be understood from the foregoing description that the machine is set in operation by the operator by moving the head 90 inwardly until the latch 87 engages the flanged collar and holds the shipper lever in clutch-engaging condition. The machine then continues to run until the operator depresses the stopping button 91 or until the machine is automatically stopped by mechanism which will presently be described. When the shipper lever, moreover, has released the flanged disk 64 for movement toward the left, the shaft 20 is free of axial pressure since the reaction of the springs 72 is entirely self-contained within the casing.

The core to be wound is rotated and positioned by a driven belt of flexible material which is herein shown as surrounding the rolls 22 and 40, and an oppositely-disposed detector member, herein shown as an idle roll or disk 92. The belt 93 comprises an endless band of rubber of sufficient length to enclose the rolls 22 and 40 and to sag somewhat between them under the pressure of the core, as indicated in Fig. 6. The belt 93 is driven without appreciable slip by the driven roll 22 and in its movement drives the idle roll 40 and rotates the core 100. The belt 93 is narrower than the length of the idle roll 40 and is permitted to move or sway laterally from side to side in response to lateral rotation of the core brought about by the action of the detector. It makes circumferential contact with the core over an extended portion of its circumference and thereby insures a uniform, slightly yielding, non-slipping drive to the core without in any way interfering with or retarding any lateral motion which may be imparted thereto. It will be noted that the moving belt 93, by wrapping about a considerable arc in the circumference of the core, develops or exerts a much greater traction on the core than is obtainable by the employment of rolls alone and, consequently, permits and facilitates the use of a high tension in the thread being wound.

The detector roll or disk 92 is mounted upon a spindle projecting outwardly from the free end of a lever arm 96 and is provided with ball bearings to reduce friction of rotation. The rim of the detector disk is convex in cross section to provide an area of reduced contact with the core 100. The lever arm is fast to a horizontal shaft 98 journaled in the panel 14 and is arranged to swing upwardly as the diameter of the core increases in the winding operation. The shaft 98 at its rear end is pinned to a horizontally-disposed arm 97 carrying near its free end a longitudinally-adjustable weight 99 and freely receiving a vertical rod 95 having at its upper end adjustable check nuts 103. At its lower end the rod 95 is bent outwardly and pivotally connected to the latch 87 already referred to. The rod 95 and the arm 97 are moved yieldingly downwardly at all times by a long tension spring 23 extending between a pin on the rod 95 and the base plate 10. The result is that when the arm 96 is elevated to a predetermined point by the increasing diameter of the core, the arm 97 will pick up the rod 95 by engaging the check nuts 103 and will automatically trip the latch 87, disengaging the flanged collar 89 and releasing the shipper lever for stopping the machine.

The angular supporting lever 85, as shown in Fig. 7, is journaled upon a boss 17 projecting from the inner face of the panel 14 and is arranged for movement about a horizontal axis. This axis of movement corresponds substantially with the point of engagement of the latch 87 with the flanged collar 89. A screw 19, having a knurled head, is threaded into the panel in position to engage the downwardly-extending arm of the lever 85 and to rock the same to move upwardly or downwardly the fulcrum point of the latch 87. In this operation the rod 95 is also raised or lowered and, accordingly, the point is adjusted at which the arm 97 will engage the check nuts 103 and lift the rod 95 to stop the machine. A tension spring 21 is connected to the latch 87 at its fulcrum point, and extending downwardly to the same pin which holds the spring 83 maintains the lower arm of the supporting lever 85 always in engagement with the end of the screw 19. This mechanism affords a convenient and accurate means of adjusting the automatic stopping point of the machine to the diameter of the core desired. The same thing may be effected by the adjustment of the check nuts 103 and ordinarily these are used for a preliminary setting of the machine, whereas the screw 19 may be used for a final close setting of the stopping point and is within convenient reach of the operator.

The tension mechanism of the machine will now be described with reference first to Fig. 5. The panel 14 is provided with a cylindrical boss chambered to receive ball bearings 102, in which is journaled a transverse shaft 104 carrying at its outer end the tension head 106 which is secured to the end of the shaft by a screw 107. The tension head has divergent flanges forming a groove about which the elastic thread 140 is led in its passage to the core being wound. At its rear end the shaft 104 carries a wheel or disk 110 of considerably greater diameter than the head 106 and preferably of aluminum or other light electro-conductive and non-magnetic metal. The disk 110 is held in place by a perforated flange 108 and nut on the inner end of the shaft. It will be noted that the shaft 104 is shouldered and that the right-hand ball bearing is held in place against the shoulder by a collar 113 interposed between the inner ball race and the tension head 106. The left-hand ball bearing is retained in place by a collar 112 and key 114 which is fitted in a slot in the inner wall of the boss 101.

The shaft 104 together with the tension head 106 and the disk 110 are arranged to spin freely in bearings 102 under the actuation of the elastic thread 140 as it is advanced to the core being wound. The speed of rotation of the disk 110 is, therefore, proportional to the rate of travel of the thread and any retardation of the disk will subject the thread to tension in that portion of its length between the tension head 106 and the core. An idle roll 115 is interposed

between the friction head 106 and the core 100 to assist in guiding the thread to the core.

A plurality of permanent magnets are employed in combination with the rotary disk 110 to create electro-magnetic retardation therein. An upwardly-extending carrier arm 124 having a hub 127 is pivotally mounted upon a transverse stud 128 projecting from a lug upon the base plate 10. At its upper end the arm 124 carries a permanent U-shaped magnet 125 arranged to embrace the rim of the disk 110, permitting the latter to rotate in close proximity to the ends of its forks. A second similar magnet 126 is also carried by the arm 124 at an intermediate point. The position of the carrier arm 124 and, consequently, the extent to which the disk 110 is embraced by the magnets 125 and 126 is manually controlled by a screw 130 having a knurled head. The screw 130 extends through the face of the panel 14 and at its inner end engages a small bell crank lever 129 which, as shown in Fig. 4, is pivotally mounted upon a bracket within the panel 14. The short arm of the lever 129 bears against one edge of the carrier lever 124, with the result that when the screw 130 is turned inwardly the carrier lever 124 is swung toward the right, as seen in Fig. 2, and the magnets carried inwardly over the rim of the disk 110, thus increasing the electro-magnetic retardation developed therein. The arm 124 is moved in opposition to the screw 130 by a tension spring 132 connected between it and the flange 16 of the panel 14. An adjustable stop screw 131 threaded into the inner face of the panel serves adjustably to determine the initial position of the lever 129 and, consequently, of the carrier arm independently of the screw 130.

Automatic variations in the tension of the thread are provided for by magnets 121 and 123 which are arranged to be shifted in their position with respect to the disk 110 during the operation of the machine. The magnet 121 is shifted in accordance with the increase in the diameter of the core being wound and the magnet 123 in accordance with the reduction in the diameter of the supply reel from which the thread is drawn.

The magnet 121 is mounted in the free end of a carrier arm 120 pivotally mounted upon the base plate 10 and connected through a rod 119 of adjustable length to a slotted arm 118 projecting outwardly from the hub of the lever 97. The initial position of the magnet 121 may be adjusted by adjusting the length of the connecting rod 119 or by shifting the point of connection between the rod and its actuating arm 118. The rate and extent of the inward movement of the magnet 120 may also be varied by adjusting the point of connection of the rod with its arm. This magnet is then advanced over the rim of the disk 110 as the arm 97 is raised by the increasing diameter of the core. With the machine adjusted as shown in Fig. 2, the magnets 125 and 126 will develop an appreciable initial tension in the disk 110 and this tension is gradually and uniformly increased from the inner to the outer winding by the movement of the magnet 121.

The supply reel 138 from which the elastic thread 140 is drawn is carried by a tubular standard 134 which projects upwardly from the upper flange 16 of the frame panel. At its upper end the standard 134 carries a yoke 135 with upwardly-extending branches in which are mounted in ball bearings centers 136 and 137 respectively. The center 137, beside being freely rotatable, is arranged for yielding longitudinal movement for releasing and engaging the end of the reel 138. Thread drawn from the reel passes directly to and about the tension head 106 in its passage to the core being wound.

It will be apparent that as the diameter of the winding upon the reel decreases, the moment arm tending to unwind it also decreases and, consequently, that a slight additional tension is introduced into the system inasmuch as the rate of delivery from the supply is maintained uniform. This variation is compensated for in accordance with a feature of my invention, and one form of suitable mechanism will now be described.

Upon the shaft 98 is journaled a bell crank lever having a downwardly-extending arm 122 which carries the magnet 123 and a horizontally-extending arm 146 extending beneath the tubular standard 134. Within this standard is mounted a rod 142 which extends freely up through the yoke 135 to a point above the supply reel 138, where it is provided with a head 143. A feeler roll 144 is mounted in the head 143 in position to rest upon the windings of thread 140 upon the reel. A downwardly-extending guide pin 145 is movably received within a vertical bore in the yoke and serves to position the head 143 and prevent angular displacement thereof. The whole mechanism is substantially balanced so that the feeler roll 144 bears lightly upon the contents of the reel but as the diameter of the windings decrease and the feeler roll 144 is permitted to descend, the weight of the parts is sufficient to cause the lever 122—146 to rock in a clockwise direction, moving the magnet 123 outwardly and, accordingly, decreasing its tension effect to compensate for the increasing tension effect of the reduced effective diameter of the windings upon the reel.

In order to prevent over-running due to the momentum of the disk 110, a brake arm 116 is provided which is arranged to engage the surface of the perforated disk 108 when the machine is stopped. The arm 116 is associated with the starting device, being secured to the end of the stem 88 between the forks which secure it to the shipper lever 78, all as shown in Fig. 3.

The operation of the machine will be clear from the foregoing description but may be summarized for convenience as follows. Having passed the end of the elastic thread 140 about the core center or kernel, the operator lifts the detector arm 96 and places the core upon the endless supporting belt 93, lowering the detector disk 92 into contact with it. It will be assumed that the screw 130 has been set to swing the arm 124, positioning the magnets 125 and 126 for the desired initial tension in the thread and that the rod 119 has been adjusted in accordance with the rate and amount of increase in tension which it is desired to impart to the thread during the winding operation. The weight 99 has also been adjusted to regulate the degree of pressure of the detector disk in accordance with the character of the core being wound. The operator will now trip the machine by pressing the head 90 inwardly until the latch 87 acts to hold the clutch in running position. The winding operation is thus initi-

ated and as this continues the detector arm 96 is raised, increasing the tension as the core diameter increases in the manner already explained, and finally the arm 97 engages the check nuts 130 on the rod 95 and trips the latch 87 when the core has reached a predetermined diameter. The machine is then immediately stopped, brakes being applied to the shaft 20 and to the rotary tension device, and the head 90 is released and moves outwardly to its initial position. The operator may then lift the detector arm 96 and remove the completed core, breaking the thread and preparing the machine for the reception of a new core.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A winding machine having core-rotating and positioning means including an elastic endless belt driven at high speed and an oppositely-disposed rotatable member arranged to engage a spherical core between them, and means for supplying a thread to the core as it is rotated.

2. A winding machine having core-rotating and positioning means including a power driven belt of rubber-like elastic material and an oppositely-disposed presser roll arranged yieldingly to engage a spherical core between them, and means for guiding a thread to the core.

3. A winding machine having core-rotating and positioning means including spaced rolls, an endless elastic belt surrounding said rolls and driven thereby, a rotary detector member located opposite to the belt and in line with the space between the rolls to engage a spherical core between itself and the belt, and thread guiding means, said belt and detector cooperating automatically to displace from the winding plane an oversize zone in the core.

4. A winding machine having core-rotating and positioning means including spaced supporting means for a driven elastic belt arranged to permit the belt to sag in the space between them, an oppositely-disposed member arranged to press a spherical core into the sag of the belt, and means for supplying thread to the core as it is rotated by the travel of the belt.

5. A winding machine having core-rotating and positioning means including a flexible belt arranged to be driven in one direction and having capacity for movement also in a direction transverse to its direction of travel, a rotatable member arranged to engage the core at a point opposite to the belt, and thread-directing means.

6. A winding machine having core-rotating and positioning means including an endless belt, a driven flanged roll supporting one end of the belt, an idle roll of greater length than the width of the belt supporting the other end of the belt, and a rotatable disk arranged to run upon the core at a point opposite to the belt and to impart angular displacement thereto.

7. A winding machine having a supply reel of elastic thread, means for rotating a core to wind the same, an interposed tension device including a magnet and a relatively movable conductor arranged to develop an electro-magnetic drag upon the thread, and means for altering the relation of the magnet and conductor in accordance with variations in the effective diameter of the supply reel.

8. A winding machine having means for rotating a core and supplying a thread thereto, a tension device including a relatively movable magnet and conductor arranged to develop an electro-magnetic drag upon the thread, and means for altering the relation of said magnet and conductor in accordance with the increasing diameter of the core being wound.

9. A winding machine having core-rotating and positioning devices, thread-supplying means, an electro-magnetic tension device, manually adjustable means for regulating the amount of tension developed by said device, and automatically acting mechanism for independently varying the amount of tension in accordance with the diameter of the core being wound.

10. A winding machine having core-rotating and positioning devices, thread-supplying means, an electro-magnetic tension device including independently mounted magnets and a rotary conductor associated therewith, manually adjustable means for moving one magnet with respect to said conductor, and automatic mechanism for similarly moving the other magnet in accordance with variations in the core diameter.

11. A winding machine having core-rotating and positioning devices, thread-supplying means, an electro-magnetic tension device including a flat disk rotated by the thread in its passage to the core, a forked magnet arranged to embrace the rim of said disk, means for moving said magnet inwardly as the core diameter increases, and adjustable connections to said magnet whereby its initial position may be varied.

12. A winding machine having means for rotating a core to wind thread thereon, a supply reel of thread, a tension device interposed between the reel and the core, and mechanism for automatically decreasing the effect of the tension device on the thread as the diameter of the reel is decreased.

13. A winding machine having core-rotating mechanism, a thread supplying reel, a rotary tension head connected to a metallic disk, a plurality of magnets disposed adjacent to the disk at separate points in its periphery, means for manually positioning one of said magnets, mechanism for automatically moving another of said magnets in accordance with the diameter of the core being wound, and mechanism governed by the diameter of the supply reel for positioning another of said magnets, all for the purpose of controlling the tension in the thread during the entire operation of winding a core.

14. A winding machine having means for supporting and rotating a core to be wound, an electro-magnetic tension device, automatic stopping mechanism, and a detector movable in accordance with the increasing diameter of the core and having controlling connections both with the tension device and said stopping mechanism.

15. A winding machine having core-rotating devices, means for guiding an elastic thread to the core, an electro-magnetic tension device including a rotary element, starting and stopping mechanism for the machine, and connections between said mechanism and said rotary element for applying a brake to the latter when the machine is stopped.

16. A machine for winding golf ball cores of elastic thread, comprising means for supporting and rotating a core, a thread guide leading thread to the core in a defined winding zone, and a pivotally-mounted arm carrying a detector disk supported in yielding engagement with the core being wound and having a narrow peripheral contact rim which tracks on the core substantially in the winding zone.

17. A machine for winding golf ball cores of elastic thread, comprising means for supporting and rotating a core, a thread guide determining a definite winding plane, and an arm arranged to swing about an axis substantially perpendicular to the winding plane and carrying a detector disk having a convex rim and being mounted to rotate about an axis perpendicular to the winding plane and making contact with the core in the winding plane.

18. A machine for winding golf ball cores of elastic thread, comprising a driven endless belt for cradling and rotating the core to be wound, means for supplying elastic thread to the core in a defined winding plane, and a detector disk with a narrow contact rim arranged to track on the core substantially in the winding plane.

19. A winding machine comprising means for supporting and rotating a core to be wound, a thread guide leading thereto, an arm arranged to swing vertically about an axis remote from the core, and a disk mounted in the free end of the arm and having a narrow peripheral contact surface for detecting the zone of maximum diameter as the core is wound and causing the core to assume another position.

20. A winding machine comprising means for supporting and rotating a spherical core about an axis of predetermined direction while leaving it free to be angularly displaced, a thread guide for delivering thread in a definite zone, and an arm arranged to swing about an axis remote from the core and carrying at its free end a disk having a narrow peripheral contact surface arranged to engage the core in the winding zone and tending automatically to displace the core as the diameter of the winding zone increases.

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