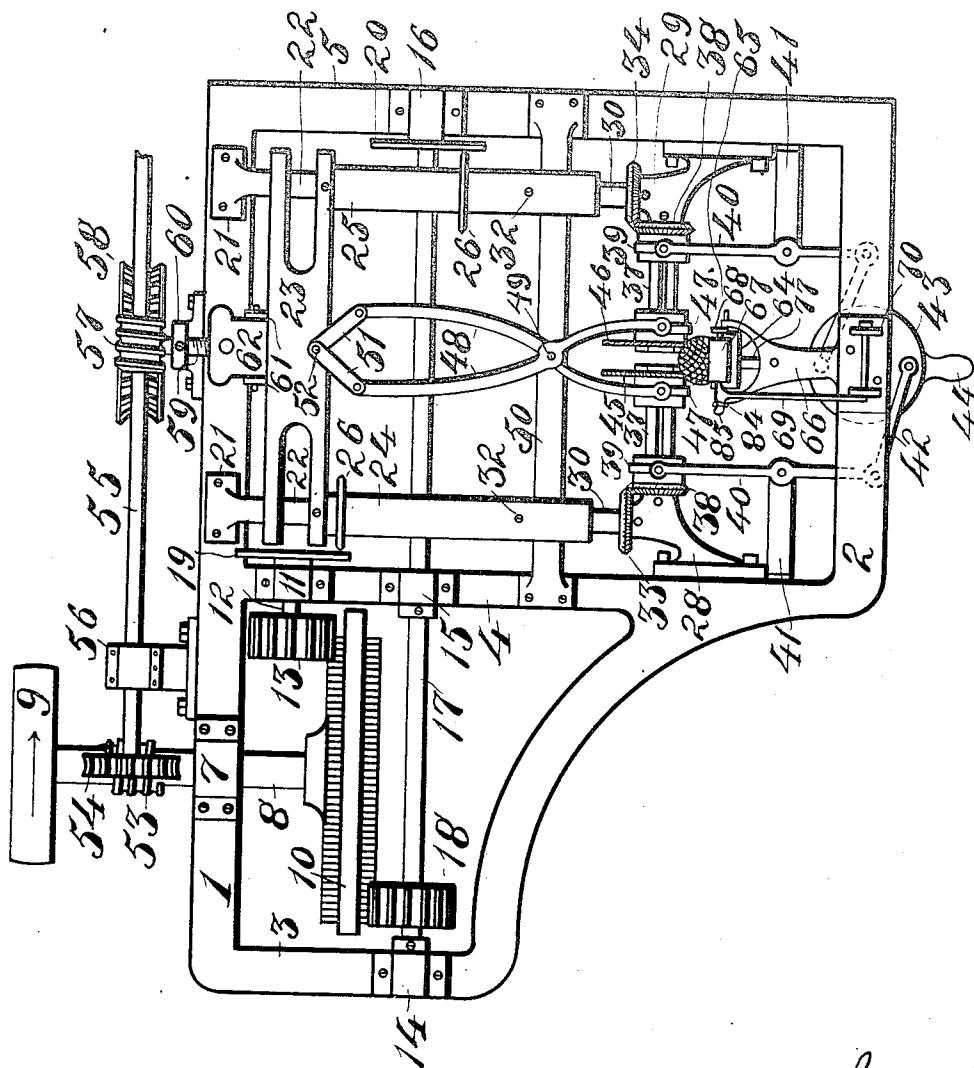


A. T. & G. H. SAUNDERS.
MACHINE FOR WINDING BALLS.

APPLICATION FILED APR. 30, 1906.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Edna Bortz
Glenara Fox

Inventors,
A. T. Saunders, and
G. H. Saunders,
by C. E. Humphrey,
Atty.

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4 SHEETS—SHEET 2.

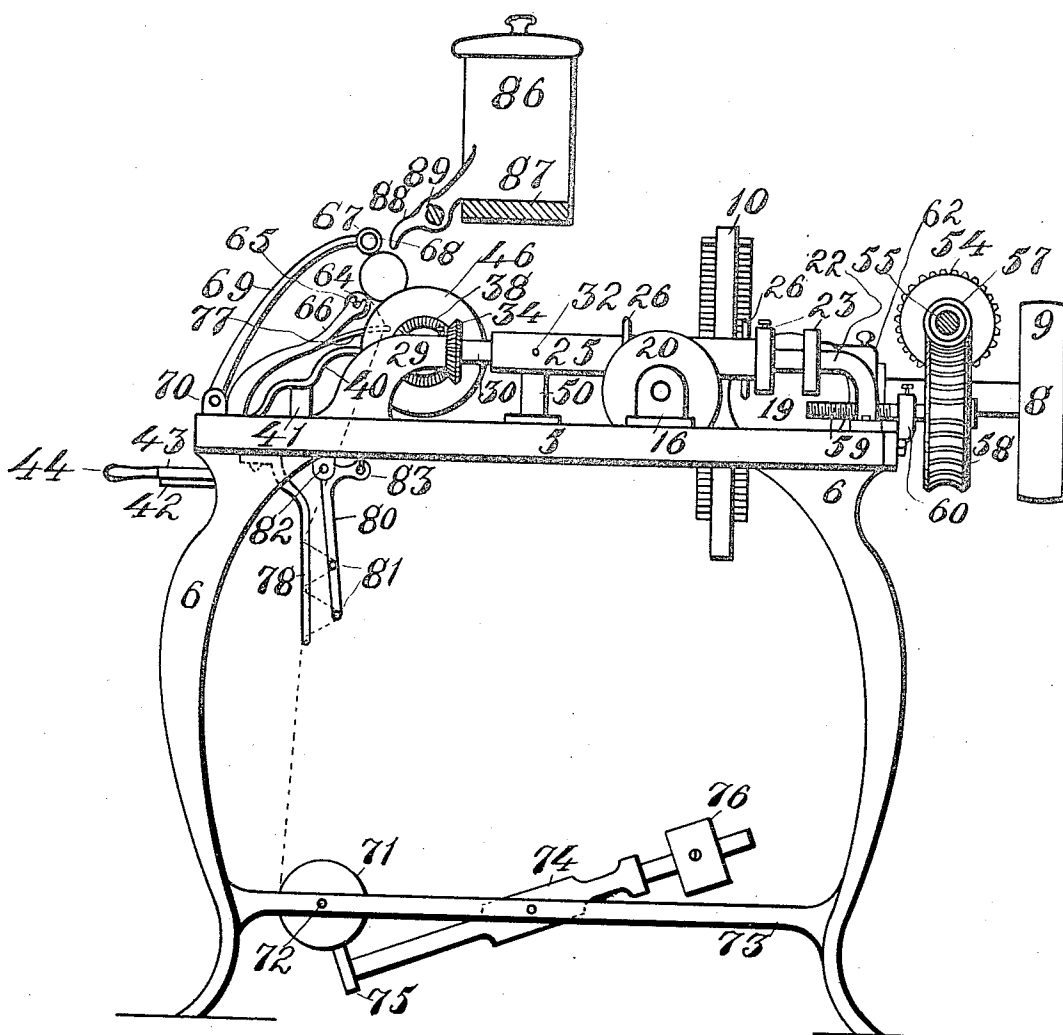


Fig. 2.

Witnesses:

Edna Bortz
Glenara Fox

Inventors,
A. T. Saunders, and
G. H. Saunders,
by C. E. Humphrey,
Atty.

No. 859,116.

PATENTED JULY 2, 1907.

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4 SHEETS—SHEET 3.

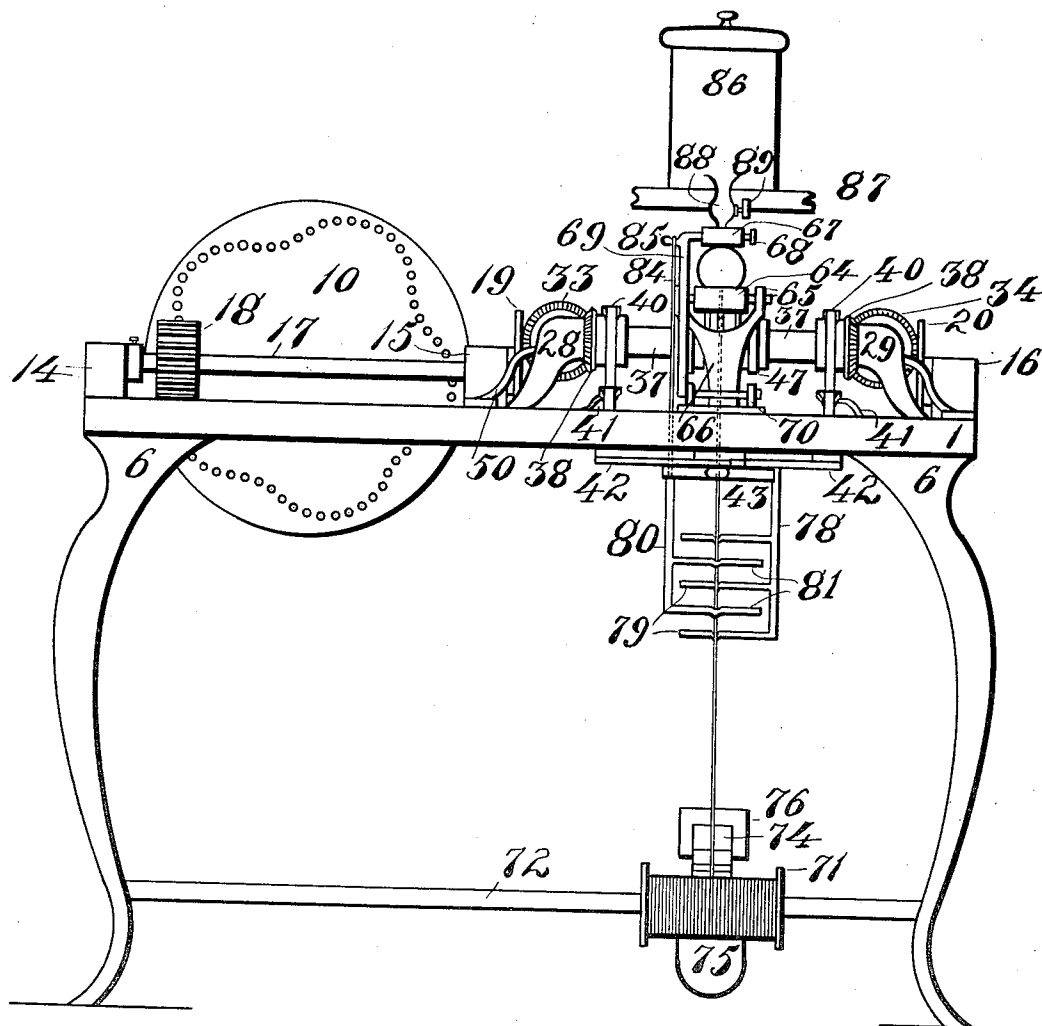


Fig. 3.

Witnesses:
Emma Portz
Glenara Fox

Inventors:
A. T. Saunders, and
G. H. Saunders,
by C. E. Humphrey
Att'y.

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4 SHEETS—SHEET 4.

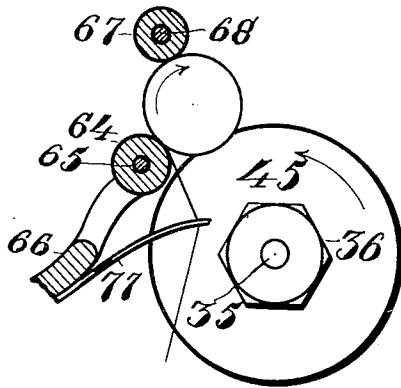


Fig. 4.

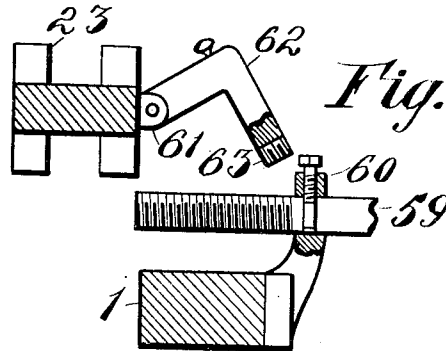


Fig. 5.

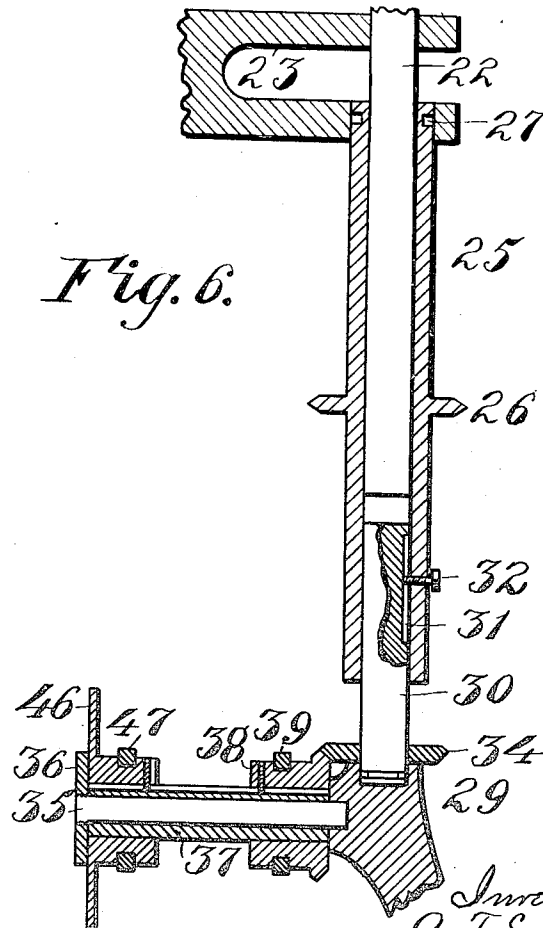


Fig. 6.

Witnesses;
Edna Bortz
Clennard Fox

Inventors,
A. T. Saunders,
and G. H. Saunders,
by C. E. Humphrey
Atty.

UNITED STATES PATENT OFFICE.

ADDISON T. SAUNDERS AND GEORGE H. SAUNDERS, OF AKRON, OHIO.

MACHINE FOR WINDING BALLS.

No. 859,116.

Specification of Letters Patent.

Patented July 2, 1907.

Application filed April 30, 1906. Serial No. 314,524.

To all whom it may concern:

Be it known that we, ADDISON T. SAUNDERS and GEORGE H. SAUNDERS, citizens of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented new and useful Improvements in Machines for Winding Balls, of which the following is a specification.

Our invention has relation to machines for placing a fibrous layer on a core or nucleus by means of a continuous winding thereon of thread or yarn; that is, primarily, to machines which are employed in the manufacture of playing balls which possess as an element of their construction, a layer formed from a mass of wound thread or yarn.

Our invention has been designed more particularly for use in the manufacture of playing balls having a main body portion composed of a layer of fibrous material formed by a series of windings of thread or yarn, preferably interlaid with an adhesive substance; but it will be evident from the subsequent description of our invention, that the main features thereof are equally applicable in applying a layer of wound thread or yarn to any ball.

Our invention resides in a machine which is capable of winding a layer of thread or yarn about a core or nucleus, avoiding any tendency to parallelism in the placement thereof, to the end that the windings on the progressively enlarging ball may overlies each other in every direction.

Another object of the invention is to effect the simultaneous application of an adhesive substance to the layer of thread or yarn during the winding operation.

Still other minor objects will appear in connection with the sub-joined description of the mechanism.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts constituting the invention to be hereinafter referred to and illustrated in the accompanying drawings which form a part of this specification in which is shown the preferred embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which come within the scope of the claims hereunto appended.

In the drawings, in which similar reference numerals indicate like parts in the different figures: Figure 1 is a plan view of our machine; Fig. 2 is a side elevation from the right of Fig. 1; Fig. 3 is a side elevation looking from the front of Fig. 1; Fig. 4 an enlarged detailed view of the mechanism for rotating the ball during the winding and the application of thread or yarn thereto; Fig. 5 is a detail partly in section illustrating the means whereby a sliding carriage contained in the mechanism is caused to move; and, Fig. 6 a detail partly in section of the mechanism for connecting the carriage with the winding disks, also showing the means whereby motion is transmitted to these disks.

Before proceeding to a detailed description of the mechanism of our device, it is believed that a brief description of the general operation thereof may be of service.

The mechanism hereinafter described consists of means for loosely confining a core or nucleus upon the peripheral surfaces of two adjacent but not necessarily parallel rotating disks, and to feed to said core or nucleus a constant supply of thread or yarn.

In order to prevent parallelism in the winding, and the consequent occurrence of nodes in the structure of the layer formed by the thread or yarn on the core or nucleus initially, and afterwards in the progressively enlarging ball, it is continuously rotated on constantly-changing axes. To accomplish this constant changing of axis in the nucleus or ball the disks are arranged to be revolved in the same direction at speeds constantly changing with respect to each other; by this is meant, that when the speed of one disk is increased, the speed of its companion disk is decreased, and vice versa; and while this produces a substantially perfect and even winding of the thread or yarn, the mechanism is so arranged that the recurrence of the changes in speed of the two disks are not absolutely regular, but on the contrary are slightly irregular, so that the core or nucleus will not be rotated upon a definitely pre-arranged variety of axes. This shifting of the axes of the core or nucleus and of the progressively enlarging ball is attained by the following mechanism: The various mechanisms hereinafter described are supported directly or indirectly upon a frame consisting of longitudinal bars 1 and 2 and transverse bars 3, 4 and 5. These bars may all be made to form an integral frame, or may be constructed separately and afterwards united, as the wishes or desires of the maker may demand. This frame is supported upon a plurality of legs 6.

Mounted in a bearing 7 on the frame bar 1 is the main driving shaft 8 of the device. This shaft bears a pulley 9 over which is passed a belt from a suitable source of power. The inner end of the shaft 8 bears a large disk 10 having on both of its faces continuous rows of projecting pins (see Figs. 1, 2 and 3). These pins are so arranged upon the faces of this disk that they form irregularly undulating lines. These undulations are so formed in placing the pins that portions thereof will extend within imaginary concentric circles drawn on the faces of the disk, and other portions of the undulations will extend outside the imaginary lines; the arrangement of these lines is such that the outer portions of the undulations will alternate with the inner portions, resulting in the production of sinuous lines of pins on the surfaces of this disk.

Mounted for rotation in a bearing 11 on the transverse frame bar 4 is a shaft 12 which bears at its left

end (in Fig. 1) a toothed wheel 13, so placed and of such a size as to mesh with the pins on one side of the disk 10. Mounted for rotation in bearings 14, 15 and 16, placed respectively on bars 3, 4 and 5 of the frame is a shaft 17 which bears at one end a toothed wheel 18 adapted to engage the pins on the face of the disk 10 opposite to that which bears the pins which engage the wheel 13. The opposite end of the shaft 12 to that which bears the toothed wheel 13 bears a flat-faced disk 19 adapted to rotate in unison with the shaft on which it is mounted; and the shaft 17 bears a similar disk 20. Secured to the upper face of the frame bar 1 are two brackets 21 having projecting horizontal cylindrical members 22. On these members is slidably mounted a carriage 23 consisting of a central body portion with laterally-extending bifurcated portions. Also mounted on the members 22 are a pair of revoluble and longitudinally-slidable sleeves 24 and 25, each mounted upon a respective member 22. These sleeves 24 and 25 bear friction disks 26, the one on the sleeve 24 is adapted to engage the face of the disk 19, and the one on the sleeve 25 is adapted to engage the face of the disk 20, whereby motion is communicated from the disk wheels 19 and 20 to the sleeves 24 and 25 respectively. These sleeves enter suitable openings in the carriage 23 and are retained in position by set screws which engage circumferential grooves 27 cut therein, (see Fig. 6), so that any motion imparted to the carriage 23 will be transmitted to the sleeves 24 and 25.

Mounted on the frame bars 4 and 5 are a pair of brackets 28 and 29 which support rotatable shafts 30. The opposite ends of each of these shafts 30 enter one of the sleeves 24 or 25. These shafts are provided with splines 31 (see Fig. 6) into which engage the ends of set screws 32 in the sleeves, by which the revolution imparted thereto is transmitted to the shafts 30. The ends of the shafts 30 which enter the brackets 28 and 29 are provided with circumferential grooves into which engage set screws which prevent the unintentional escape of the shafts from their bearings. Mounted on the shafts 30 adjacent the brackets 28 and 29 are beveled gears 33 and 34. Mounted irrevolubly in each of the brackets 28 and 29 is a pair of stub shafts 35 with their axes preferably in alignment with each other and provided near their adjacent oppositely-disposed ends with nuts 36, secured on suitable threads on the ends thereof. Mounted for rotation on each of the shafts 35 is a sleeve 37. These sleeves are held against longitudinal movement by the nuts 36 and the brackets 28 and 29. Motion is communicated to these sleeves in the following manner: Mounted on the sleeves 37 are beveled gears 38 which are adapted to mesh with one of the gears 33 or 34. The hubs of the gears 38 are made unusually long and are splined to the sleeve 37 so that any motion communicated to the shafts 30 will be transmitted by means of the beveled gears to the sleeve 37. In order to throw these gears into and out of mesh with each other, they are provided with suitable collars 39 to which are pivotally attached the ends of rocking arms 40 which are pivoted on brackets 41 fastened to the frame of the machine. The opposite ends of the arms 40 are connected by means of links 42 with a revoluble plate 43 mounted on the under face of the frame bar 2, which

has a handle 44 by which it is manipulated. It will be seen that by revolving the plate 43 in one direction, the motion given to the links 42 will be transmitted by means of the levers 40 to the gear hubs causing them to slide longitudinally on the sleeves 37 and withdraw from engagement with the gears 33 and 34, whereby their intermeshing is temporarily suspended to be re-established upon a reversal of the motion of the plate 43.

The disks on the peripheries of which the winding is to take place are designated in the drawings by the reference numerals 45 and 46 respectively, and are each provided with elongated hubs slidably mounted on the sleeves 37 and are splined thereto in order to compel their revolution in unison with the motion of this sleeve. In properly shaped grooves in the hubs of the disks 45 and 46 are seated collars 47 to which are pivotally attached the ends of a pair of levers 48. These levers 48 are constructed in the form of tongs and are pivoted on a pin 49 supported by a cross bar 50 which extends from the frame bar 4 to the bar 5. The opposite ends of the levers 48 are connected by means of a pair of links 51 with a pin 52 on the carriage 23.

From this description it will be seen that as the carriage is slid on the members 22 toward the disks 45 and 46, the links 51 will separate the ends of the levers to which they are connected which causes a similar separation in the ends of the levers which are connected to the collars 47, thereby slightly sliding the disks 45 and 46 away from each other, the distance of their separation being in direct proportion to the amount of movement or slide of the carriage 23 on the members 22.

Experience has shown that where the winding of a ball is attempted from a fixed point of feed to a ball suitably supported upon two disks arranged to revolve at similar speeds, the winding will take place in substantially a single plane; and it is also apparent that the winding will take place in substantially a single plane on the surface of the ball if one of the disks on which the ball is located is revolved at a greater and constant speed than its companion disk. Therefore, to avoid this feature in the winding and to avoid all parallelism in the placement of the yarn or thread, the disks in this device are arranged to alternate in speed with respect to each other which is accomplished by the mechanism heretofore described, the operation of which is as follows:

Power communicated by means of the pulley 9 to the driving shaft 8 revolves the disk 10 in unison therewith, and the teeth on the faces of the disk revolve the pinions 13 and 18 at constantly varying speeds, this operation being such that the wheel 13 will be running relatively slowly while the gear 18 is running rapidly, and vice versa, due to the peculiar arrangement of the pins on the disk.

As has just been stated, these pins are arranged upon irregularly undulating or sinuous lines, and the undulations are so placed with respect to each other that the portion of an undulation nearest the shaft or center on one side of the wheel will be approximately diametrically opposite the outer portion of an undulation farthest from the center on the opposite side of the wheel. For instance, those teeth which form the inner

portion of an undulation on one side of the disk will be in engagement with the wheel 18, while those which form the outer undulation on the opposite side of the wheel will be in engagement with the wheel 13 at substantially the same time. It will be apparent that the wheel which is engaging the teeth which forms the convex portion of an undulation will be revolved more rapidly than the wheel which engages the teeth which form the concave portion of an undulation; and as these engagements take place simultaneously the speeds of the wheels 13 and 18 will be constantly differing with respect to each other, and these variations in speed will be transmitted through the mechanism hereinafter described to the ball sustaining disks 45 and 46 which will cause them to run rapidly and then slowly, these alternations being so timed or arranged that one disk is running at a higher speed than the mean speed while the other is running at a lower speed, and vice versa.

In the winding of a layer of thread or yarn upon a ball of ordinary thickness, the mechanism heretofore described will be sufficient for the winding operation, but it has been found that where the layer of thread or yarn which is placed on a ball is to be of unusual thickness, it is advantageous that the distance between the disks on which the ball is sustained during the winding operation be slowly increased to retain the same relation to the ball as it increases in size, and also that the speed of both disks be proportionately increased relative to the speed of the driving member, in order that the peripheral travel of the winding disks for each variation or phase of movement of the driven members be increased proportionately to the increase in size of the growing ball. In order to effect these two objects simultaneously, the carriage 23 is caused to slide by a slow and almost imperceptible movement towards the disks 45 and 46 during the entire operation of winding by mechanism which will be hereinafter described, from which will result the following operations:

The levers 48 will be separated from each other by means of the links 51 and the disks correspondingly separated by reason of the engagement of these levers with the hubs of these disks. The sliding of the carriage will also carry with it the two sleeves 24 and 25, which as they move towards the gears 33 and 34 carry the friction disks 26, 26 towards the outer edge of the disks 19 and 20, which increases the speed of the sleeves 24 and 25, and through the connected mechanism the speed of the revolution of the disks 45 and 46. This is due to the well known mechanical principle that a friction disk wheel taking motion from a flat-faced revolving disk is increased in speed as it moves away from the center of the driving member.

The mechanism for accomplishing the slow and progressive motion of the carriage 23 is as follows: On the main driving shaft 8 is a worm 53 into which is arranged to mesh a worm wheel 54 mounted on a horizontal shaft 55 supported by a bearing 56, and which in turn bears a worm 57 which meshes with a worm wheel 58 mounted on a shaft 59 in a bearing 60. This shaft 59 is provided with a groove in which engages a set screw in the bearing 60, whereby longitudinal motion of the shaft 59 is prevented. The opposite end of the shaft 59 from that on which the worm wheel 58 is mounted is threaded with threads of an extremely low pitch. On

the face of the carriage 23 which is opposite to that into which the sleeves 24 and 25 are mounted are a pair of ears 61 between which is an L-shaped arm 62 which has a notched lower end threaded with threads capable of intermeshing with the threads of the shaft 59; and hence, as the shaft 59 is slowly revolved by the action of the mechanism heretofore described, the carriage 23 will be slowly and progressively carried along due to the engagement of the threaded lower end of the arm 62 with the threads on the shaft 59. When the ball being wound on the disks 45 and 46 has reached a required size and is removed, the arm 62 is lifted, disengaging the threaded end from the shaft 59, and the carriage pushed backward to its initial position by hand.

The core or nucleus on which the layer of thread is wound and the afterwards growing ball is sustained in position on the peripheral surfaces of the disks 45 and 46 by means of two rollers which sustain it while permitting its free rotation. The lower of these two rollers, designated in the drawings by the reference numeral 64 is provided with a central shaft 65 the ends of which project longitudinally some distance beyond the roller itself, and these extended ends of the roller 65 are seated in the upper notched ends of a bifurcated bracket 66 which sustains the roller in position. The arms of the bracket are preferably spread sufficiently to permit some endwise or longitudinal motion of the roller 64 between them; this is done by making the notches in the frames of sufficient size to permit the shaft of the roller to slide easily therein. This roller 64 is situated below the center of the core or ball and sustains it from downward movement. The other roller which sustains the ball is designated in the drawings by the reference numeral 67 and it is mounted on a shaft 68 formed integral with an arm 69 which is pivotally mounted in bearings 70 on the frame bar 2. This roller 67 is kept from sliding off the end of the shaft 68 by having the end thereof enlarged sufficiently to prevent the same, and this shaft is of such a length as to permit considerable endwise sliding of the roller 67 thereon. This roller 67 is situated above the center of the core or ball and assists in preventing the same from becoming displaced from its seat on the disks 45 and 46. The thread or yarn which is to be wound on the ball is supplied from a spool or reel 71 mounted on a shaft 72 extending between a pair of braces 73 connecting the legs which support the frame of the machine.

A tension device is customarily employed to prevent the spool from over-running and consists of an arm 74 pivoted on a shaft between the braces 73 and having its forward end provided with a shoe 75 which bears against the coil of thread or yarn on the reel 71, and having on its rear end an adjustable counterweight 76 by which the tension of the thread may be increased. The thread is carried from the reel 71 upwardly through a thread guide 77 which is customarily attached to the under face of the bifurcated bracket 66. It is preferable in winding some balls to gradually increase the tension upon the thread or yarn as the ball increases in size, thereby making the outer portion of the layer of thread tighter than those portions which lie more immediately in contact with the core or nucleus; and in order to cause this tension to be increased in proportion as the ball increases in size, we employ a tension device

whose function is to gradually increase this tension on the thread slowly and increasingly as the ball progressively enlarges. This tension device consists of a downwardly-extending bar 78 attached to some portion of the under face of the frame of the machine and having projecting horizontally therefrom a plurality of fingers 79. This arm 78 and its fingers constitute one member of our tension device, the other member which is adapted to co-operate therewith and progressively increase the tension on the thread or yarn consists of a bell-crank 80 having a depending lower arm from which project one or more fingers 81 similar to the fingers 79 and adapted to lie parallel with and pass between said fingers 79. This bell-crank 80 is pivoted on a shaft 82 suitably supported beneath the frame of the machine. The other end of the bell-crank, designated in the drawings by the reference numeral 83 is connected by means of a light rod or wire 84 with a hook 85 on the upper outer end of the arm 69 which bears the upper roll 67. The fingers 79 and 81 are adapted to lie in a parallel plane with each other when the winding operation commences, and it is preferable to form in these fingers a series of notches or V's at the point where the thread will encounter them in order to keep the thread properly in alinement. The thread from the reel 71 is carried upwardly to and fro between the alternate fingers 79 and 81 as shown in Fig. 3, where the thread is shown to pass back of the fingers 81 and in front of the fingers 79.

The operation of this device is as follows: As the ball increases in size, due to the increasing size of the layer of thread placed thereon, the roller 67 will be gradually raised which swings the arm 69 on its pivot, thereby raising the hook 85 which draws upward the wire or rod 84, which being attached to the short arm 83 of the bell-crank causes the lower arm 80 thereof to swing outwardly in such a manner as to remove its fingers 81 from alinement with the fingers 79 on the stationary arm 78. This separation of the fingers 79 and 81 will keep on increasing as the ball increases in size, due to the mechanism just described; and experience has shown that the farther these fingers 79 and 81 are apart the greater the portion of the circumferential peripheries the thread is compelled to travel around in contact with these fingers, the greater the tension imposed upon the threads.

It will be apparent from the description of the machine, that instead of employing a disk wheel 10 with its pins and the toothed wheels 13 and 18 to secure an alternating speed in the revolution of the disks 45 and 46, other devices such as eccentric gears and similar mechanical devices may be used to accomplish equally efficient results, without in any manner departing from the scope of this invention, which primarily resides in the sustaining of a ball on the peripheral surfaces of the two disks, the speed of each of which is preferably constantly changing with respect to the speed of its companion disk.

When it is desired to incorporate with the layer of thread or yarn an adhesive substance, it may be stored in a suitable tank such as illustrated in the drawings and designated by the reference numeral 86, which shows a suitable receptacle situated upon a shelf 87 provided with a discharge tip 88, the flow of liquid through which is controlled by a cock 89. The point of discharge of the nozzle 88 is located so that liquid which is

discharged from the receptacle will fall upon the ball being wound on the disks 45 and 46.

What we claim and desire to secure by Letters Patent, is:—

1. A machine of the class described comprising a plurality of rotatable disks, means to sustain a ball rotatably on the peripheries of said disks, and means to vary the speed of one of said disks. 70

2. A device of the class described comprising a pair of disks, means for sustaining a ball rotatably on the peripheries of said disks, and means to change the speed of one of said disks with respect to the speed of its companion disk. 75

3. A machine of the class described comprising two disks, means to sustain a ball on said disks, and means to cause said disks to alternate in speed with respect to each other. 80

4. A device of the class described comprising two disks, means for sustaining a ball on said disks, means to cause said disks to alternate in speed with respect to each other, and means to supply thread or yarn to said ball. 85

5. A machine of the class described comprising two rotatable disks, means for confining a ball on said disks, means to cause an increase in speed in one of said disks, and means to cause a simultaneous decrease of speed in the other disk, and means to supply thread or yarn to said ball. 90

6. A device of the class described comprising two rotatable disks, means for confining a ball on said disks, means to cause said disks to alternate in speed with respect to each other, means to supply thread or yarn to said ball, and means to progressively increase the distance of said disks from each other during said winding operation. 95

7. A machine of the class described comprising two rotatable disks, means for confining a ball on said disks, means for supplying thread or yarn to said ball, and means for progressively increasing the speed of said disks during said winding operation. 100

8. A machine of the class described comprising two rotatable disks, means for confining a ball on said disks, means to cause said disks to alternate in speed with respect to each other, means for supplying thread or yarn to said ball, and means for progressively increasing the speed of said disks during said winding operation. 105

9. A machine of the class described comprising two rotatable disks, means for confining a ball on said disks, means to cause said disks to alternate in speed with respect to each other, means for supplying thread or yarn to said ball, means for progressively increasing the distance between said disks during the winding operation, and means for progressively increasing the speed of said disks during said winding operation. 110

10. A machine of the class described comprising two rotatable disks, means for confining a ball on said disks, means for simultaneously causing an increase in the speed of one disk and a decrease in the speed of the other disk and vice versa, means for supplying thread or yarn to said ball, means for progressively increasing the distance between said disks, and for progressively increasing the speed of said disks during the winding operation. 115

11. A machine of the class described comprising two rotatable disks, means for confining a ball on the peripheries of said disks, means to vary the speed of one of said disks with respect to the speed of its companion disk means for supplying thread or yarn to said ball, and means for progressively altering the tension of said thread during said winding operation. 120

12. A machine of the class described comprising two rotatable disks, means for confining a ball on said disks, means for causing an alteration in the speed of one disk with respect to the other, means for supplying thread or yarn to said ball, and means for progressively altering the tension of said thread or yarn during said winding operation. 125

13. A machine of the class described comprising two rotatable disks, means for confining a ball on said disks, means for causing an increase in speed in one disk and a 130

- simultaneous decrease in speed in the other disk, means for supplying thread or yarn to said ball, and means for progressively altering the tension of said thread or yarn during said winding operation.
14. A machine of the class described comprising in combination a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, means for independently rotating each of said disks, and means for varying the speed of each of said disks.
15. A machine of the class described comprising in combination a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, independent means for rotating said disks, said means being arranged to vary the speed of one disk with respect to the other, and means for simultaneously causing an alteration in speed in both of said disks.
16. A machine of the class described comprising in combination two rotatable disks, means for confining a ball on the peripheral surfaces thereof, means for supplying thread or yarn to said ball, independent means for rotating said disks arranged to alter the speed of each disk with respect to the speed of the other disk, means for progressively altering the speed of both disks, and means for progressively altering the tension of said thread or yarn during said winding operation.
17. A machine of the class described comprising two rotatable disks, means for confining a ball on said disks, means for revolving said disks so that the speed of one disk will vary with respect to the speed of the other disk, means for supplying thread or yarn to said ball, means for progressively increasing the space between said disks during the winding operation, and means for progressively altering the tension of said thread or yarn during said winding operation.
18. A machine of the class described comprising two rotatable disks, means for confining a ball on the peripheral surfaces thereof, means for causing said disks to alternate with each other in speed, means for supplying thread or yarn to said ball, means for progressively altering the speed of both of said disks, and for simultaneously and progressively altering the tension of said thread or yarn during the winding operation.
19. A machine of the class described comprising two rotatable disks, means for confining a ball on the peripheral surfaces thereof, means for causing said disks to alternate with each other in speed, means for supplying thread or yarn to said ball, means for progressively increasing the space between said disks during said winding operation, means for progressively altering the speed of both of said disks during said winding operation, and means for progressively altering the tension of said thread or yarn during said winding operation.
20. A device of the class described comprising in combination a driving member, two members arranged to be driven by said driving member, a pair of rotatable disks, means to confine a ball on said disks, means to supply thread or yarn to said ball, and means carried by said driving member to operate said driven members at speeds alternating with each other.
21. A device of the class described comprising in combination a driving member, two suitably mounted driven members, a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, means to supply thread or yarn to said ball, and means carried by said driving member to alternately increase and decrease the speed of each of the driven members.
22. A device of the class described comprising in combination a driving member, two driven members, means carried by said driving member arranged to alternately increase and decrease the speed of said driven members simultaneously, a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, and means for connecting said driven members with said rotatable disks, whereby the motion imparted to said driven members is communicated to said disks.
23. A device of the class described comprising in combination a driving member, two driven members, means carried by said driving member to simultaneously operate said driven members at different speeds, a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, and means for connecting said driven members with said disks whereby motion is communicated from said driven members to said disks, and means for progressively increasing the speed of said disks.
24. The combination in a device of the class described, comprising in combination a driving member, two driven members, means carried by said driving member to simultaneously alter the speeds of said driven members with respect to each other, a pair of rotatable disks, means for sustaining a ball on the peripheral surfaces of said disks, a device for increasing the speed of said disks arranged to communicate motion from said driven members to said disks.
25. A device of the class described, comprising in combination a driving member, two driven members, means for alternately varying the speeds of said driven members carried by said driving member, a pair of rotatable disks, means for sustaining a ball on the peripheral surfaces of said disks, means for communicating motion from said driven members to said disks, and means for progressively increasing the speed between said disks during the revolution of said disks.
26. A device of the class described, comprising in combination a driving member, two driven members, means carried by said driving member for alternately varying the speeds of said driven members with respect to each other, a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, means for supplying thread or yarn to said ball, means for communicating motion from said driven members to said disks, and means for progressively increasing the space between said disks during the winding operation.
27. A device of the class described, comprising in combination a driving member, two driven members, a plurality of pins on said driving member arranged upon sinuous lines and adapted to engage said driven members whereby said driven members are operated in unison with said driving member at different speeds, a pair of rotatable disks, means for confining a ball on said disks, means for supplying thread to said ball, and means for connecting said driven members with said disks.
28. A device of the class described, comprising in combination a driving member, a plurality of pins on said member placed to form continuous undulating lines, a pair of driven members arranged to engage said pins on said driving member, said undulating lines of pins being so placed on said driving member that the pins forming the convex portion of one undulation will engage one of said driven members and the pins forming the concave portion of an undulation on the opposite side of said driving member will engage the other driven member simultaneously, a pair of rotatable disks, means for confining a ball on the peripheral surfaces thereof, means for supplying thread or yarn to said ball, and means for connecting said disks with said driven members whereby said disks are rotated.
29. A device of the class described comprising in combination a driving member, a plurality of pins on said member arranged in eccentric lines, a pair of driven members arranged to engage and be operated by said pins on said driving member at different speeds simultaneously, a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, means for supplying thread or yarn to said ball, and means for connecting said driven members with said disks.
30. A device of the class described, comprising in combination a driving member, a plurality of pins arranged in eccentric lines on said member, a pair of toothed wheels arranged to engage said pins at approximately opposite points from the center of said driving member, shafts mounted for rotation to support said toothed wheels, disks on said shafts, a slidable carriage suitably mounted adjacent said mechanism, mechanism carried by said carriage adapted to receive motion from said disks, a pair of ball sustaining disks rotatably mounted, means for confining a ball on the peripheral surfaces of said last-named disks, means for supplying thread or yarn to said ball while on said disks, and means for conveying motion from the means mounted on said carriage to said ball carrying disks.
31. A device of the class described, comprising in combination a driving member, two driven members, means carried by said driving member for alternately varying the speeds of said driven members with respect to each other, a pair of rotatable disks, means for sustaining a ball on the peripheral surfaces of said disks, means for communicating motion from said driven members to said disks, and means for progressively increasing the speed between said disks during the revolution of said disks.

nation a driving member, a slidable carriage, means connected with said driving member for sliding said carriage, two driven members, means carried by said driving member arranged to operate said driven members with alternate speeds with respect to each other, a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, means for supplying thread or yarn to said ball, and means for connecting said carriage with said disks whereby the movement of said carriage will progressively increase the space between said disks.

32. A device of the class described comprising in combination a driving member, a plurality of pins on said member arranged in eccentric lines, a pair of driven members arranged to engage and be operated by said pins on said driving member at different speeds simultaneously, a pair of rotatable disks, means for confining a ball on the peripheral surfaces of said disks, means for supplying thread or yarn to said ball, means connecting said driven members with said disks, means interposed between said driven members and said disks for progressively altering the speed of said disks without increasing the speed of said driven members.

33. A device of the class described comprising a driving member, two driven members, means to actuate said driven members with varying phases of movement, the

phases of movement of one member alternating with respect to the phases of movement of the other member, two rotatable disks, means for sustaining a ball on said disks, means for supplying thread or yarn to said ball, and means for progressively altering the peripheral travel of said disks relatively to the length of the phases of movement of said driven members.

34. A device of the class described comprising a driving member, two driven members, means to impart to said driven members varying phases of movement, the phases of movement of one member altering with respect to the phases of movement of the other member, two rotatable disks, means for sustaining a ball on said disks, means for supplying thread or yarn to said ball, means for communicating motion from said driven members to said disks, and means for proportionately altering the peripheral travel of said disks with relation to the phases of movement of said driven members.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

ADDISON T. SAUNDERS.
 GEORGE H. SAUNDERS.

Witnesses:

C. E. HUMPHREY,
 GLENARA FOX.