

F. T. ROBERTS.
METHOD OF MAKING BALLS.
APPLICATION FILED JAN. 7, 1918.

1,329,311.

Patented Jan. 27, 1920.

2 SHEETS—SHEET 1.

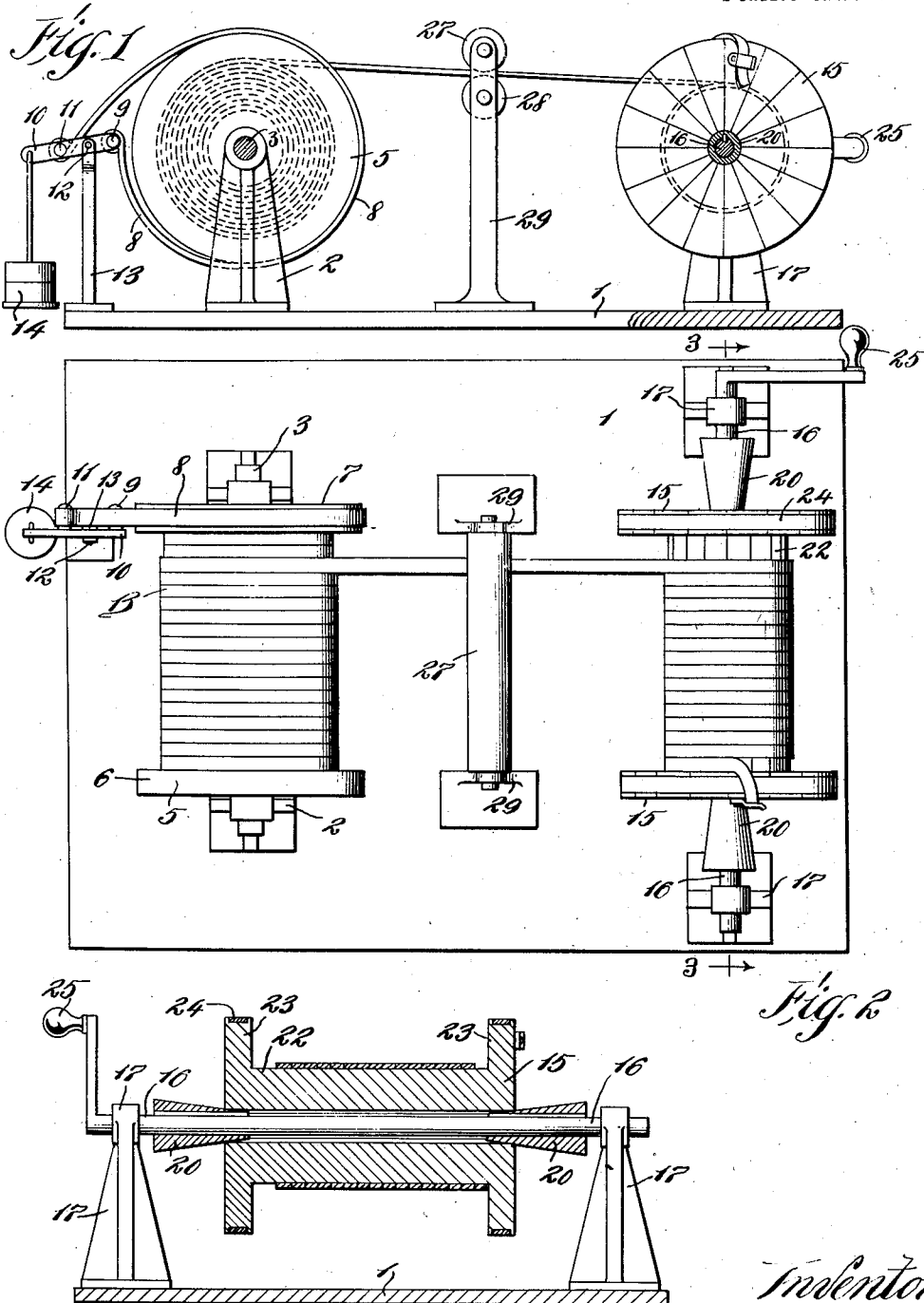


Fig. 3

Fig. 2

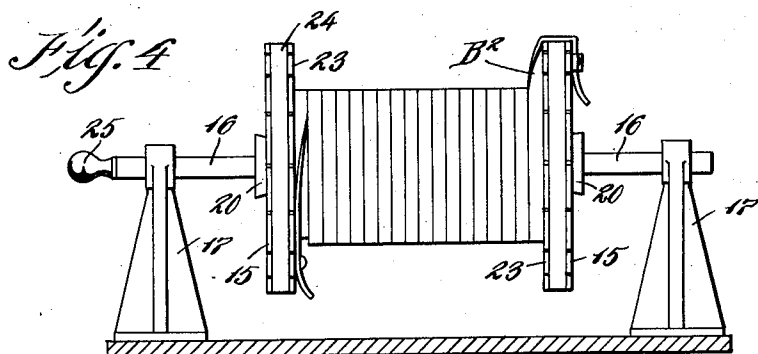
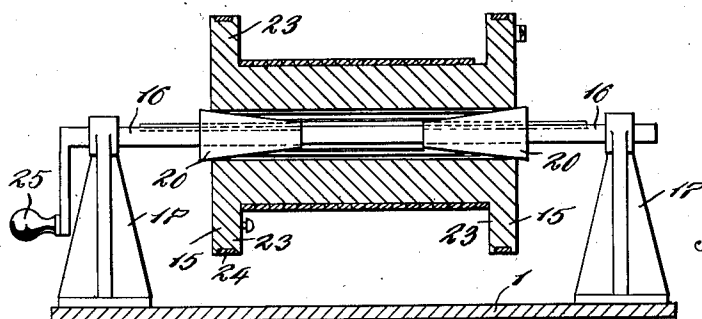
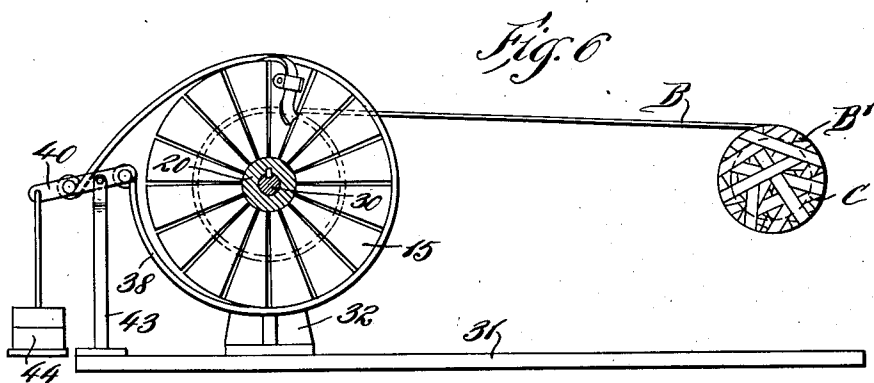
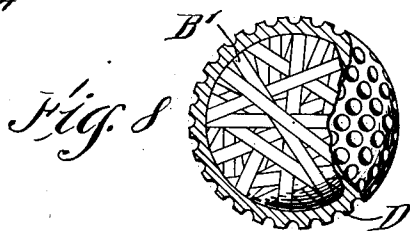
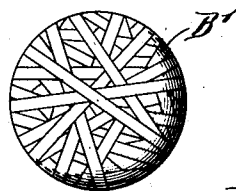
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UNITED STATES PATENT OFFICE.

FRED THOMAS ROBERTS, OF CLEVELAND HEIGHTS, OHIO, ASSIGNOR TO THE ARANAR COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

METHOD OF MAKING BALLS.

1,329,311.

Specification of Letters Patent.

Patented Jan. 27, 1920.

Application filed January 7, 1918. Serial No. 210,655.

To all whom it may concern:

Be it known that I, FRED THOMAS ROBERTS, a citizen of the United States, residing at Cleveland Heights, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Methods of Making Balls, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide an easily practised method for the manufacture of golf balls capable of producing balls of greater resiliency, with consequent increased distance of flight when the ball is struck.

A further object is to provide a method adapted to be practised and carried out with the use of simple and conveniently operable apparatus.

In the manufacture of golf balls of the character having a core, and a winding of elastic material about the core inclosed by a suitable hard rubber balata or gutta percha cover, it has been the practice to make the winding about the core of elastic strands wound on the core under tension. This tension serves the purpose of compressing the core and also to render the body of the winding itself more compact with a view to obtaining the result, such, that when the ball is subjected to a sharp blow, the force of the blow is transmitted through the cover, through this winding and to the resilient core, under compression by reason of the winding, thus bringing into play the resiliency of the three elements of the ball. It has been found, however, that such balls are more resilient immediately after winding than they are at a period several hours or a few days after the ball is made. As the result of experiment, I have found that the reason for this is that the rubber strands wound about the core under tension relax gradually, relieving the compression on the core and the cover. To overcome this difficulty various expedients have been tried, such for example as winding the rubber about the core under tension substantially up

to the elastic limit of the strand. It has been attempted to maintain the compression by giving the core a hollow center and filling it during the winding or after winding with elastic fluid under very high pressure. Such a method as the latter is illustrated and described in Patent No. 1,167,396 to J. R. Gammeter, granted January 11, 1916. The first of these methods presents the difficulty of frequent breaks of the strands while they are being wound and still does not give the desired amount of tension on the core. The second method has the effect of expanding the strands immediately adjacent the core circumferentially and increasing their tension, but the strands at the outer portion of the winding adjacent the cover are not expanded circumferentially any appreciable amount and are only slightly compressed radially. Furthermore, filling the core with expansible fluid, such as air under very high pressure, makes the ball dangerous and liable to explode when exposed to heat or subjected to an extraordinary blow.

My method, hereinafter described, eliminates all of the above difficulties and provides a ball which practice has demonstrated can be driven farther than other balls of the same age and same general type, and furthermore that the balls made by my method retain their full resiliency through a long period of time.

To eliminate the above difficulties and accomplish the result sought, I previously prepare the rubber band or thread, called generically a strand which I am to wind on the core by stretching it uniformly substantially to its elastic limit and retaining it in that position until it relaxes somewhat, assuming a "new set," so to speak; I then stretch the strand still further and hold it in this position of added tension for a time, whereby it again relaxes by reason of its inherent plasticity. This operation of alternately stretching the strand, and giving it a period of rest to allow relaxation to take place, may be repeated a number of times, until the tendency of the strand to slacken has been reduced to a practical minimum. Following the last

relaxation, I wind the strands so treated about an elastic core under a tension substantially equal to that which they had preceding the last relaxation. As the tendency to relax at that tension has been practically exhausted, it follows that, when wound in the ball under the same tension, there will be practically no tendency to relax. Thus the rubber strands will remain in the ball under the tension they had when wound therein and will not slacken after the cover is applied. In other words, by my operation, the relaxant property of the rubber strands appears to be eliminated or very much reduced, leaving the extended strand with its elastic properties so that when wound onto the core its tension remains constant until the rubber actually deteriorates, which is of course a very long period compared to the short period of hours during which the rubber relaxes when first put under tension.

The form of core which I prefer to use may be that illustrated in my application No. 186,476, filed August 16, 1917. Such a core is made hollow and closed in an atmosphere of highly compressed air imprisoning the air under pressure, which the core itself when closed may retain, whereby when the winding and cover is added the wall is so greatly strengthened that there is no danger of explosion. However, I have found by experiment that other form of cores may be used, either hollow or solid, and with or without internal pressure, the essential characteristic by reason of which I obtain the desirable results being that of placing an elastic core under constant tension which is not relaxed after the ball is completed.

The accompanying drawings show a ball made according to my process and also illustrate an apparatus for carrying out the process. This invention is hereinafter more fully described in connection with the accompanying drawings and its essential characteristics are summarized in the claims.

Referring to the drawings, Figure 1 is a side elevation of the apparatus for treating the strands before winding them onto the ball; Fig. 2 is a plan of the same; Fig. 3 is a substantially axial section of one of the reels, being along the line 3—3 of Fig. 2; Fig. 4 is a side elevation of the reel illustrated in Fig. 3; Fig. 5 is a section similar to Fig. 3 showing the expansible spool in its distended position; Fig. 6 shows the method of using the reel when winding the band or thread wound thereon onto the core of a ball; Fig. 7 shows the exterior of the winding surrounding the core; Fig. 8 is a similar view illustrating the completed ball with the cover about the winding.

For clearness the apparatus is herein described first and then the process described in detail in the use and operation of the ap-

paratus, it being understood that any suitable apparatus may be employed in performing the process.

Describing the parts of the apparatus shown in the drawings, 1 indicates a suitable support from which rise upright bearing members 2 carrying a shaft 3. On the shaft 3 is mounted a reel or spool 5 having end flanges 6 and 7. The flange 7 is shown as embraced by a flexible brake band 8, one end of which is pivoted at 9 to a lever 10 and the other end pivoted at 11 at each side of the pivot 12 of the lever which is carried on an upright 13. The end of the lever is shown as carrying a weight 14, which, it will be noted, tends to contract the band about the flange of the spool. Opposite the spool 5 is a corresponding spool 15 of special construction carried on a shaft 16 mounted on uprights 17 rising from the support 1. Slidably keyed to this shaft 16 are conoidal collars 20 extending into the spool 15 as shown in Figs. 3 and 5. The spool comprises an assembled series of sector-shaped members forming a drum portion substantially cylindrical at 22, at each end of which are flange members 23 having edge grooves occupied by rubber bands 24 which retain the sections of the spool in their assembled position, while still allowing them to separate slightly and move radially under the influence of the wedge bearings or cone collars 20 which may be thrust inwardly.

A shaft 16 is provided with a suitable crank 25 for manually operating the spool 15 whereby a rubber band B may be wound from the spool 6 to the spool 15 under any desirable tension. Guide rolls 27 and 28 are mounted in uprights 29 and positioned parallel to the shafts 3 and 16 whereby, as the ribbon or band of rubber B progresses from one end of the spool to the other, it may be prevented from turning upon or crossing the next adjacent turn of material.

The rubber band is first wound under normal tension on the spool 5, and the end of the band B threaded between the rolls 27 and 28 and started to wind upon the spool 15, which winding may be continued by operating the crank 25. One or more layers of the rubber are wound onto the spool 15 as shown in the drawings. The wedges or cones 20 are thereafter driven inwardly to expand the rubber strands about the spool 15 evenly throughout as they are already under heavy tension given by reason of the brake-band 8 during the first winding process. It is necessary to stretch them equally to avoid breaking, and it is obvious that the device will accomplish this as each of the several sectors will travel outwardly from the shaft 16 an equal distance, expanding the entire spool evenly.

The reason for putting only one or two

layers of the rubber band onto the spool 15 at a time is that additional layers are not extended evenly or in equal proportion to the inner layer; that is to say, as the inner layer is extended in circumference, each individual turn necessarily becomes thinner and smaller in cross section. Thus the distance between the spool and the next layer is reduced, and is not caused to expand in the same ratio as the inner layer, and the circumferential distance of each turn of the outer layer is not increased as it would be if the inner layer retained its original cross sectional area. If this result is multiplied through several layers it makes such an appreciable difference with the result at the outer layers that it is preferable to operate only on one or two layers at a time. It is for this same reason that the expanding of the core of the ball during the winding or after the winding, as previously mentioned does not produce the results accomplished by this invention. The difference, however, in the expansion of the inner layers and the outer layers and the relative tension due to such expansion, is greater on the ball, owing to the interstices between criss-crossing turns and the resulting opportunities of the rubber to flow laterally and fill these interstices without increasing the resiliency.

The elastic bands 24 expand as the conical wedges are forced into the spool while retaining their position and holding the sectors, comprising the expansible spool, in their relative positions as shown in the drawings.

Experience has shown that after winding the rubber band onto the expansible spool under tension that the expanding of the spool stretches each strand with but little danger of breaking the strands. The spool may then be removed by withdrawing the shaft 16, leaving the conical wedges in position and another spool wound and its strands treated in the same fashion by moving similar wedges inwardly of the spool.

I have found that good results may be obtained when using ordinary rubber bands by subjecting them to substantially the following treatment.

First, winding them onto the expansible spool, under tension approximating what seems to be the elastic limit of the strand, then stretching all the strands a little nearer to the breaking point by expanding the spool slightly, which requires simply moving the wedges 20 inwardly a short distance. The spool with the rubber in this condition is then allowed to stand for a period of a few hours, when all the strands may be given additional tension, having relaxed their tension during such interval. After standing for another period of a few hours, the rubber may be given

a still greater tension by moving the wedges 65 inwardly still farther; thus through a series of successive stages the rubber is stretched considerably beyond what would have been the breaking point of the band in its original state. When the strands are 70 thus stretched to their new limit, they exert as great or greater tension than before this treatment; whereupon they may be wound upon the core of the ball at substantially the tension last given them, 75 whereby great circumferential tension tending to compress the core is obtained and without liability of the strands relaxing, consequently insuring the retaining, indefinitely of added resiliency. 80

Fig. 6 illustrates winding the rubber band from the spool to the ball. It will be noted that the spool is expanded, the wedge 20 being thrust inwardly substantially its full distance, slightly separating, 85 circumferentially, the several sectors of the spool. The spool with the wedges in position may readily be slipped over a shaft indicated at 30 on uprights 32, rigid on a suitable base 31, and a brake device comprising a band 38 corresponding to the band 8, and tightened by a lever 40, actuated by a weight 44, pivoted on the upright 43, may resist the turning of the spool so that as the ball is wound to draw the strand B from the 95 spool the proper tension will be obtained and each turn of the strand on the ball will add to the circumferential tension tending to compress its core.

In Fig. 6 the core C of the ball is shown 100 as surrounded by several layers of criss-crossing turns of the band or thread B' which is continued until it reaches a size adapted to tightly fit the interior of the cover or casing D of the ball. Fig. 7 illustrates the ball after the winding is completed and the end of the strand suitably fastened. Fig. 8 illustrates the usual cover fitted and vulcanized around the winding B'. 110

In carrying out my process in actual practice, as fast as one or more layers are wound onto the expansible spool the ends of the strand may be suitably fastened as indicated at B² Fig. 4, and the spool removed 115 from the shaft (by withdrawing the shaft from its bearings) and set to one side for the proper length of time. Thus the using of a supply of such expansible spools allows the continuous operation of the winding and stretching and a supply of spools with stretched rubber is thereby obtainable for allowing continuous operation of the winding of the balls. 120

From the foregoing description it will be 125 seen that I have provided a method and simple apparatus for carrying out the method of securing a winding of rubber

bands about an elastic core which may provide great circumferential tension compressing the core and at the same time form a layer of very tightly compressed rubber having its full elasticity but without any of the undesirable characteristics resulting from the tendency of such strands to relax their tension, when first wound. I have found that this stretching on the spool does not take the life out of the rubber and neither does it impair its resiliency; but, on the contrary, secures greater resiliency in the finished ball. Golf players find that a ball wound according to this process responds to drives for greater distances than similar balls to which they are accustomed, and that such resiliency is retained for a much longer period of time.

Having thus described my invention, what I claim is:

1. The process of making a golf ball, which consists in winding a resilient core with stretched rubber strands, previously treated with alternate mechanical stretchings and subsequent relaxations until the final tension exceeds the original elastic limit and then inclosing the same within a suitable cover.

2. The process of making golf balls consisting of stretching a rubber strand substantially to its elastic limit, holding it under tension for a period of time, thereby allowing it to relax, and then stretching it further and winding it upon a resilient core.

3. The process of making a golf ball core consisting of stretching a rubber strand under high tension and holding it under such tension for a period sufficient to allow it to relax, then subjecting it to additional tension and again giving it time to relax, then winding it upon a central body under a tension substantially equivalent to that last given it.

4. The process of making a golf ball, consisting of winding a rubber strand under high tension onto a stretching device, allowing the strand to relax, thereafter stretching the strand by means of said device, then allowing it to again relax and thereafter winding the strand onto an elastic core while stretching it more than the strand would originally stand.

5. The process of making a golf ball consisting in winding a rubber strand in a thin layer about an expandible member, expanding said member to stretch the strands evenly and allowing the strands to relax through a period of time, then winding such strand upon an elastic core without relaxing such tension, and inclosing the core and winding with a cover tightly fitting over the winding.

6. The process of making wound balls, consisting of mechanically stretching a

strand without changing the inherent character of its composition, thereafter giving it time to relax, and thereafter winding it under tension into a ball.

7. The process of making rubber wound balls, consisting of stretching a rubber strand by a mechanically applied pulling force, allowing the strand to relax, and thereafter winding it onto a core at substantially the tension it had preceding said relaxation.

8. The process of making balls, consisting of submitting a rubber strand to alternate stretchings and relaxations, and thereafter winding it into a ball.

9. The process of making balls, consisting of submitting a rubber strand to alternate stretchings and relaxations, thereafter winding it into a ball at a tension substantially equivalent to that which it had next preceding the last relaxation.

10. The process of making golf balls, consisting of submitting a rubber strand to a plurality of alternate mechanical stretchings and time relaxations and thereafter winding it onto a core, and placing a cover about it.

11. A step in the process of making balls having a strand winding of a stretched material which inherently tends to relax when put under tension, consisting of substantially exhausting the capacity of the strand to relax before it is wound onto the ball.

12. A step in the process of making balls, having a winding of rubber strands under tension, consisting of reducing the natural capacity of the stretched rubber strands to relax before they are wound into the ball.

13. In the process of making balls having wound strands under tension, the step of alternately mechanically stretching and resting the strands preceding the winding, to reduce the relaxant characteristic of the strands.

14. The process of making balls consisting of winding rubber strands in a stretched condition onto a temporary holder, allowing a period of time for the strands to relax, and thereafter winding them into the ball under tension.

15. The process of making balls, consisting of stretching a strand and winding it in this stretched condition onto a temporary holder, allowing a period of rest for the wound strand to relax, and thereafter expanding the holder to stretch the strand and again allowing it to relax (such stretching and relaxing being performed one or more times as desired) and thereafter winding the strand onto a core.

16. The process of making balls, comprising stretching a strand and winding it in this stretched condition onto a temporary holder, expanding the holder and thereafter winding the strand onto a ball after the strand has been relaxed.

17. The process of making golf balls, consisting of stretching a rubber strand and winding it in this stretched condition onto an expansible holder, allowing a period of
5 rest for the wound strand to relax, thereafter expanding the holder to stretch the strand and allowing it to relax (such stretching and relaxing being performed one or more times as desired), thereafter

winding the strand onto a core with sub- 10
stantially the same tension which it had next preceding the last relaxation, and thereafter securing a cover about the wound core.

In testimony whereof I hereunto affix 15
my signature.

FRED THOMAS ROBERTS.