No. 697,917. Patented Apr. 15, 1902.

E. KEMPSHALL.

MANUFACTURE OF GOLF BALLS.

(Application filed Nov. 21, 1901.)

(No Model.)

Fig. 1.

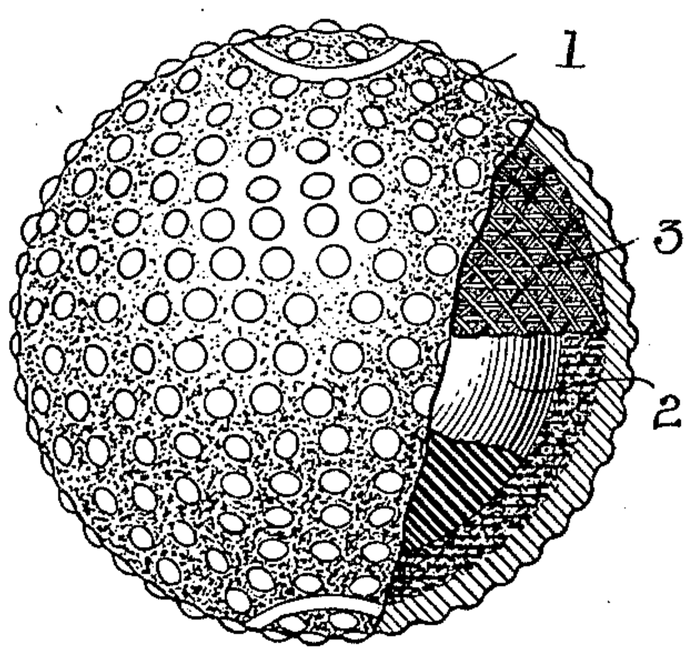
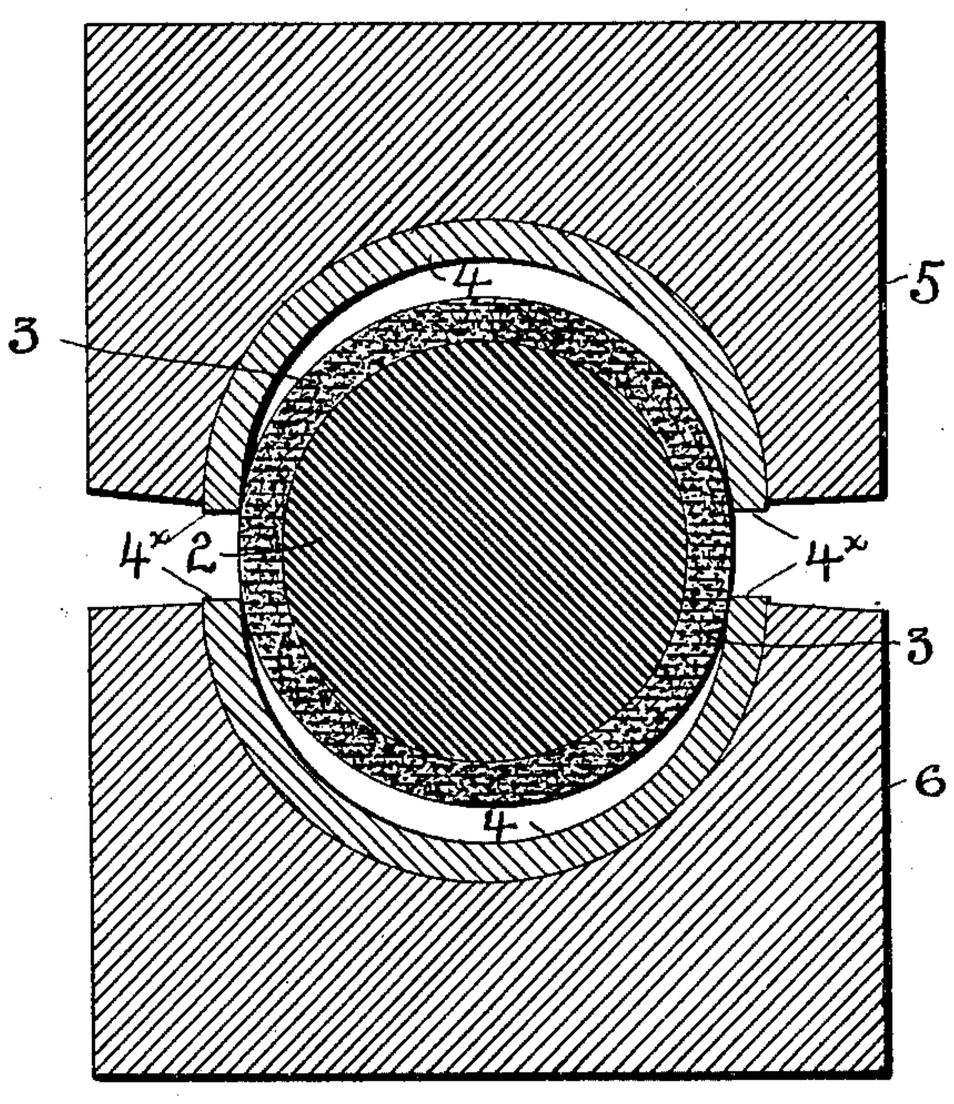


Fig. 2.



WITNESSES

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MANUFACTURE OF GOLF-BALLS.

SPECIFICATION forming part of Letters Patent No. 697,917, dated April 15, 1902.

Application filed November 21, 1901. Serial No. 83,090. (No model.)

To all whom it may concern:

Be it known that I, ELEAZER KEMPSHALL, a citizen of the United States, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in the Manufacture of Golf-Balls, of which the following is a specification.

This invention relates to balls such as used in golf and certain other games; and its objects are to improve the quality, efficiency, and stanchness of the balls and also to improve the method of producing them.

The main object of the present invention is to effect an intimate union of the jacket with the outer shell, so as to strongly reinforce the latter, and thus improve the resiliency, durability, and other qualities of the finished ball.

Other objects will hereinafter appear.

In the accompanying drawings, Figure 1 is a view, partly broken away, of the ball made according to my present improvements; and Fig. 2 illustrates the preferred method of joining the shell to the jacketed core.

Similar characters of reference designate like parts in the views.

The shell (designated as 1) consists of a relatively hard but springy material, such as celluloid, while the filling comprises a relatively soft substance 2, which is elastic in all directions. For this filling I employ any suitable material, such as rubber of suitable consistency, but preferably gutta-percha or one of its substitutes. I first inclose the filling in a more or less tough jacket or coat, which consists of one or more layers of fibrous material, such as linen, twine, or hemp, sisal, or the like. In this instance I make said jacket by winding the twine 3 repeatedly around the filling, so as to form a ball, the windings passing over and over and forming a closely-compacted coat, although the filling may be otherwise provided with a jacket. In its original shape the nucleus is substantially round, although it may depart from the spherical form within the scope of the invention; but I prefer that its bulk shall be a little too large for the final capacity of the shell. I then apply to the jacket an adherent material, preferably a preparation of celluloid in a fluid condition. This treatment may be carried to different degrees to produce different results; but preferably the fluid celluloid or other compound is caused to substantially saturate the jacket. The ball as so far prepared may then be dried, preferably by exposing to air for a short time, thus forming an adherent nucleus.

The shell I preferably form in two semi-spherical segments 4, Fig. 2, between which the treated nucleus-ball is placed. The parts thus assembled are placed between forming-dies—as, for instance, 5 and 6—whereupon the latter are pressed together by means of suitable mechanism, thus forcing the shells together, so as to bring their edges into intimate contact. To said edges cement is previously applied, so that when they are forced together they adhere, although the invention is not limited to this particular method of effecting adhesion. The dies may be heated by steam or otherwise for bringing the material of the shell-segments into suitable condition and consistency both for uniting them and also for facilitating the compressing and shaping action of the dies. When celluloid is employed, the heating of the dies effects a softening of the shell, so that it may be more readily pressed from its original to its finished or final size, and the dies may be then allowed to cool before the balls are taken out, so as to give the shells an opportunity to reharden, whereby they are enabled to retain their shape when removed. The abutting edges of the original segments at $4^{\times}$ may be somewhat full, thereby to furnish material for properly forming the joint between them as they are subjected to the final compression. By reason of the described compression of the celluloid segments over the adherent mass by means of heated dies the outer shell combines with the cement or other adherent material with which the jacket was permeated, so that the jacket and the shell become intimately united, the jacket becoming in a sense embedded in the shell upon the inner side thereof and hence strongly reinforcing the same. The fibrous coat is thus enabled to effectually protect the shell from undue deterioration by reason of hard usage, and for this reason it becomes practicable to make the shell thin, so that it may be more flexible and elastic. Thus liveliness of the

finished ball is increased, while the strength of the reinforced or composite shell is sufficient to hold the central mass under compression.

One result of the preliminary treatment of the fibrous coat is to partially or completely (as may be desired) fill the meshes of the fiber, and thereby prevent the material of the central mass from flowing outward and becoming unduly absorbed by the jacket itself when the ball is finished in the hot dies.

The jacket may be treated in various ways with various compounds within the scope of my invention, and the material of the inner mass, the coat, and the outer shell may also be changed so long as the jacket is substantially united with the outer shell when they are properly brought together, which operation may be performed in other ways and under other conditions.

My present improvements in construction and method are applicable not only to golf-balls, but also to balls for use in playing billiards and analogous games, and it will be understood that the thickness of the shell and also the firmness and relative size of the center pieces may be varied in accordance with the requirements of any particular game or use for which the balls may be employed.

I usually make the exterior surface of golf-balls pebbled or corrugated to any design or configuration which may be preferred by the player. In this instance the ball is represented as finished with relatively slight elevations of a spherical conformation; but in billiard-balls of course the outer surface should usually be a smooth and true spherical surface.

For a golf-ball the shell is preferably made of celluloid, which is stiff and springy, and hence well adapted for use in this game, while the interior is preferably made of gutta-percha. The object of such a combination is to produce a two-fold springiness in the ball, or, in other words, to enable the elasticity of the filling to coöperate with the springiness of the shell, so as to instantly restore the latter to its normal shape after distortion by a blow, and thus to enhance the resiliency of the ball as a whole. The elasticity of the filling, and hence its promptness in recovering from the blow, is greatly enhanced by having it constantly under compression, since the outward pressure thereof in all directions tends constantly to assume and maintain a spherical shape, or, in other words, an outward pressure, such as caused by compression, is of material assistance in enabling the ball to spring instantly back to its original shape, and hence to rebound when thrown against an object, as well as to fly with greater speed and to cover a greater distance when struck by an implement. It will be seen that one of the important features of the ball resides in causing the springiness of the reinforced shell and elasticity of the filling to coöperate in producing a ball of greatly-increased efficiency.

It will be understood that the jacket covering the soft nucleus is of importance in manufacture in cases where the shell is compressed over the nucleus whether or not the parts are heated at the pressing operation, since even if the parts are cold the tendency of the nucleus when subject to pressure is to flow out between the approaching edges of the shell, which tendency is entirely overcome by the confining action of the relatively tough jacket, and in cases where heat is employed, and hence where the nucleus is rendered still softer and more liable to flow, the jacket becomes of still greater importance.

From the foregoing it will be seen that the finished ball comprises a relatively soft elastic nucleus, a relatively hard reinforced springy shell. This reinforcement is of great value, since when the ball is given a knock the force thereof is diffused, and hence the ball is generally altered from its true spherical shape, whereby the elasticity of the nucleus acts over a large area with greatly-increased effectiveness, so that the ball much more readily assumes its normal shape and is thus more lively and efficient. It will be understood that when the ball is given a sharp knock with a corner or small end of an implement the normal tendency of the shell, especially when the latter is made of celluloid and has very thin walls, as illustrated in the drawings, is to dent in sharply, thus effecting only the part of the nucleus which is right behind the area of impact and compacting only a small portion of the nucleus without tending generally to alter the entire conformation thereof, so that only this small portion of the nucleus would be materially effective in returning the shell to its original shape, whereas by placing a tough springy jacket over the nucleus and causing it to unite to the shell the sharp indentation of the latter is prevented, since if the reinforced shell is pushed inwardly anywhere a large area thereof is necessarily affected and dragged inwardly to a slight extent, so that instead of a deep indentation being produced in the nucleus over a small area the latter is slightly flattened over a large area, and thereby the entire shape of the nucleus, as well as the shell, is a little distorted, and in consequence the whole energy of the imprisoned mass, added to the natural resiliency of the compound shell, is called upon and the ball is restored instantly to its normal position. Moreover, by employing said backing for the shell the liability of cracking of the latter is practically eliminated, particularly since the presence of such packing prevents undue indentation of the shell, as just explained. Both the shell and the reinforcement may be made of varying thickness. Preferably the fiber is passed over and over the nucleus to form a closely-compacted coat of material thickness, so as to more readily transmit and spread the force of the blow and distribute said force over a large area of the compressible elastic center-

piece, and so as also to form a resilient mass *per se*.

Having described my invention, I claim—

1. The process of making playing-balls, consisting in winding twine or the like around a nucleus of elastic material, causing an adherent compound to permeate the twine, making a shell in segments which approximate their final form, and compressing the segments to final form upon the prepared nucleus.

2. The process of making playing-balls, consisting of winding several layers of twine or the like around a filling of gutta-percha, applying cement to the twine, making spheroidal celluloid segments, pressing the segments together over the prepared filling so as to compress the same, and uniting the edges of the segments.

3. The process of making playing-balls, consisting of winding several layers of twine or the like around a filling of gutta-percha, applying celluloid compound to the twine, making spherical celluloid segments, subjecting them to heat, pressing them together over the prepared filling so as to compress the same, and uniting the edges of the segments.

4. The herein-described process of making playing-balls, consisting of compacting a coat of twine or fibrous material over a filling of gutta-percha or the like, causing a celluloid compound or its equivalent to permeate said coat, drying said compound, and compressing heated celluloid shell-sections over the coated filling, substantially as set forth.

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Witnesses:
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