No. 740,403. PATENTED OCT. 6, 1903.

H. D. DAY.

BALL.

APPLICATION FILED NOV. 17, 1902.

NO MODEL.

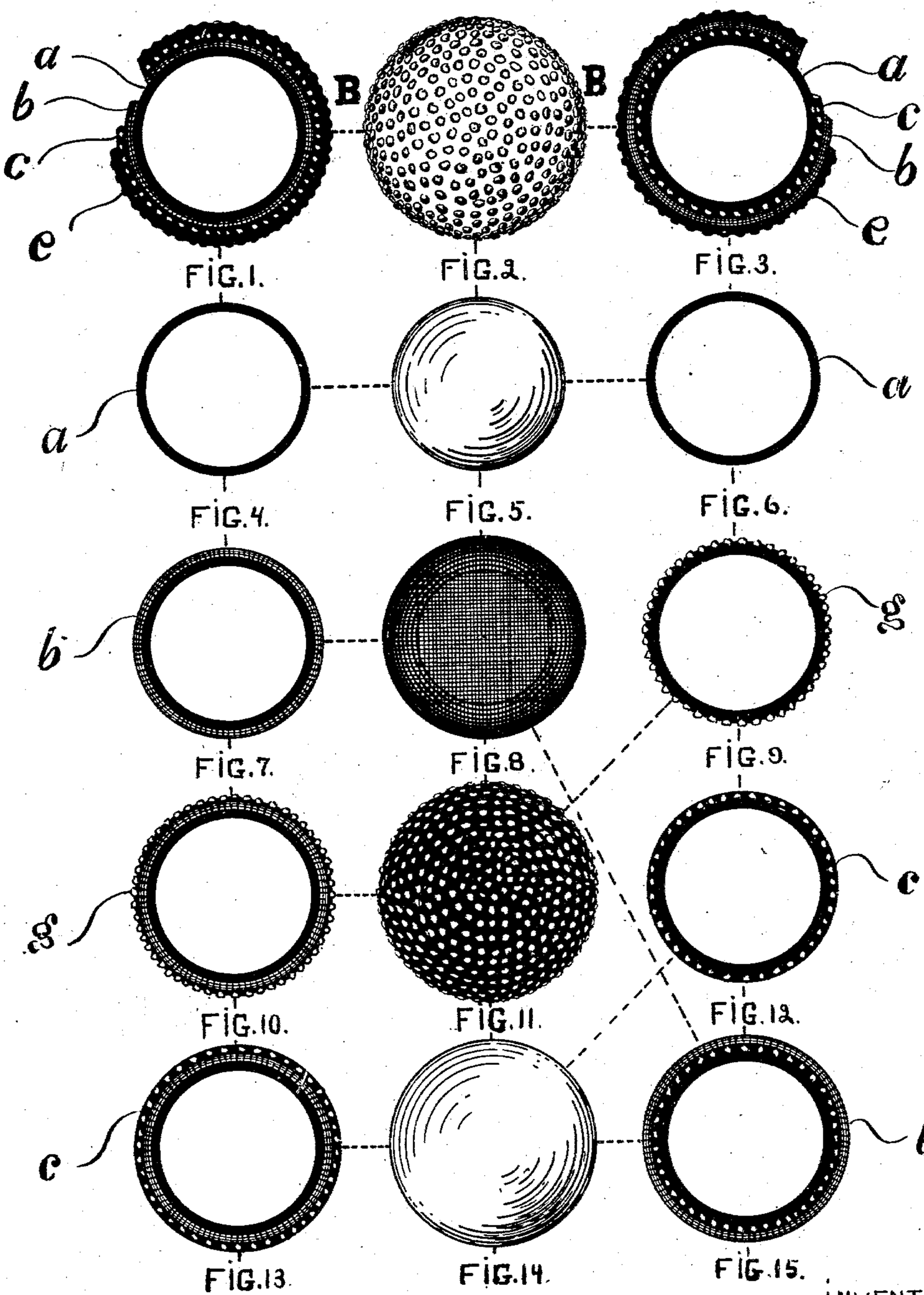

FIG.1. FIG.2. FIG.3.

FIG.4. FIG.5. FIG.6.

FIG.7. FIG.8. FIG.9.

FIG.10. FIG.11. FIG.12.

FIG.13. FIG.14. FIG.15.

WITNESSES,

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No. 740,403. Patented October 6, 1903.

UNITED STATES PATENT OFFICE.

HOWARD DORRANCE DAY, OF PROVIDENCE, RHODE ISLAND.

BALL.

SPECIFICATION forming part of Letters Patent No. 740,403, dated October 6, 1903.

Application filed November 17, 1902. Serial No. 131,718. (No model.)

To all whom it may concern:

Be it known that I, HOWARD DORRANCE DAY, residing at 216 Medway street, in the city of Providence, in the county of Providence and State of Rhode Island, have invented new and useful Improvements in Balls Used in Sports, of which the following is a specification.

My invention relates to the structure of balls for use in sports, and particularly of golf-balls; and its object is to provide a ball of maximum resiliency, of perfect elasticity, of stability of its spherical form, a ball whose liveliness may be varied at pleasure by varying the degree of its elasticity and whose weight may also be varied without impairing its resiliency, and a pneumatic ball more perfectly protected than heretofore against rupture or damage caused by the impact of a blow.

In carrying out my invention I employ a hollow inner spherical shell or envelop of elastic and resilient material and of sufficient tensile strength to withstand a considerable bursting pressure. This shell is filled with compressed air or other gas. In order to withstand the outward or bursting pressure of the compressed gas within and also the additional strain of a heavy blow from without, I provide a strength-giving or pressure-resisting layer outside of the inner envelop, which has both flexibility and tensile strength and may be made of any suitable material—such as leather, fabric, or windings of thread or cord—applied in the manner presently to be described. To compensate for the loss of weight due to the gaseous filling used in place of the ordinary solid core, I provide outside of the pressure-resisting layer a layer of elastic and flexible material in which are embedded small dissociated pieces of material of a high specific gravity, such as lead shot. These pieces are arranged so as to be free from friction against one another and so as not to impair the flexibility of the containing envelop and are uniformly distributed, so as not to destroy the weight symmetry of the ball. By changing the size or quantity of the weight-giving pieces the weight of the ball can be varied at pleasure. The result is best accomplished by using lead shot of small size embedded in soft rubber to keep them firmly in place and to prevent them from coming into contact with one another. By placing the layer of shot in such a manner as to be at or near the outer surface of the layer of material in which they are embedded and directly inside of the external layer, presently to be described, the shot serve a further purpose of protecting the strength-giving layer and pneumatic envelop within from damage or rupture by a blow from without. Outside of this weight-giving and protective layer I provide an outer protective envelop to take the wear to which the ball is subjected and to further protect the layers within from injury. This outer layer must have suitable elasticity and toughness.

Referring to the drawings, Figures 1, 2, 4, 5, 7, 8, 10, 11, 13, and 14 show in section and in elevation an embodiment of my invention, illustrating the method or steps used in constructing the ball in accordance therewith; and Figs. 3, 6, 9, 12, and 15 show a modified form of construction.

The following description will sufficiently explain the figures without a more detailed description of the views illustrated in the figures.

Like parts in all the figures are indicated by like letters of reference.

The inner layer *a* is a shell or envelop of soft and flexible but elastic and tough material, such as rubber, and is of true spherical form. The shell *a* furnishes an air-tight lining or envelop for containing the compressed gas, in which a puncture may be readily closed in the process of filling the same with air or other gas. In order to give the ball proper strength to resist the pressure due to the compressed gas within or to a blow from without, I place about the shell *a* windings of thread, cord, or other suitable material in three zones about the three perpendicular axes of the shell, each zone occupying approximately ninety degrees of the surface of the shell, as shown in Figs. 7 and 8. These windings constitute a strength-giving or pressure-resisting layer *b*. By the foregoing method of winding each part of the shell is covered with two layers of windings perpendicular to each other, so as to resist the burst-

ing stress of the shell in two perpendicular directions. Furthermore, the windings when thus applied are symmetrical with relation to the diameter of the ball, and thus preserve its weight symmetry. Between the windings and the shell beneath may be applied a coating of elastic cement to bind the windings to the shell *a* and to bind the threads or cords together. The cord should be applied at constant tension to preserve uniformity of structure. Additional groups of windings may be applied in a similar manner if greater strength is desired to resist an increased pressure. The two layers *a* and *b* having now been joined, the wall of the shell *a* is punctured by any suitable means, such as a hypodermic needle, and air is introduced at the required pressure through the opening and the opening thereafter hermetically sealed. Outside of the strength-giving layer *b* I provide a layer of flexible and elastic material of uniform thickness, like soft rubber. This layer is indicated at *c*. Embedded within the layer *c* and evenly distributed are small dissociated pieces of a material of high specific gravity. (Shown in the drawings as lead shot of small size.) In constructing the layer *c* a layer of shot is preferably embedded in the layer *c* near the outer surface thereof and just within the external or protective covering next to be described. The outermost covering or protective layer *e* is a coating of tough and elastic material, such as vulcanized rubber, and may be molded or otherwise applied to the outer surface of the ball to fit the ball for use in the game of golf. The outer layer should be of uniform thickness and its exterior surface may be provided with suitable markings or protuberances such as are commonly used in golf-balls.

It will now be observed that the inner pneumatic shell filled with compressed gas will be reinforced and kept from bursting by the strength-giving layer *b*, which in turn will be protected not only by the outer or protective layer *e*, but by the shot arranged on the outer surface of the weight-giving layer *c*. The layer *c* therefore accomplishes the double result of giving the ball the proper weight and the consequent carrying power required of golf-balls and also of protecting the layers *b* and *a* from a blow from without, which might otherwise tear the same and rupture the ball.

The method of constructing the strength-giving layer *b* by windings about the three perpendicular axes of the ball not only better preserves the symmetry of the ball than similar devices heretofore used, but also produces a stronger layer for the same weight of material than has heretofore been obtained, owing to the employment of the resultant of the tensile strengths of the perpendicular cords.

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

1. A pneumatic ball comprising an inner shell of elastic material containing a compressed gas; a pressure-resisting layer outside of the inner shell consisting of windings of suitable material; a layer of elastic material outside of the pressure-resisting layer having embedded and evenly distributed therein dissociated masses of material of high specific gravity adapted to protect the pressure-resisting layer from rupture caused by a blow and also to give weight to the ball; and an outer protective covering.

2. A pneumatic ball comprising an inner shell of elastic material containing a compressed gas; a pressure-resisting layer outside of the inner shell consisting of windings of suitable flexible material; a layer of elastic material outside of the pressure-resisting layer having embedded therein and evenly distributed near the outer surface thereof dissociated masses of material of high specific gravity adapted to protect the pressure-resisting layer from rupture caused by a blow and also to give weight to the ball; and an outer protective covering.

3. A pneumatic ball comprising an inner shell of elastic material containing a compressed gas; a pressure-resisting layer outside of the inner shell consisting of windings of suitable flexible material symmetrically arranged about the three perpendicular axes of the shell; and a layer of elastic material outside of the pressure-resisting layer.

4. A pneumatic ball comprising an inner shell of elastic material containing compressed gas: a pressure-resisting layer outside of the inner shell consisting of windings of suitable flexible material symmetrically arranged about the three perpendicular axes of the shell; a layer of elastic material outside of the pressure-resisting layer having embedded therein and evenly distributed near the outer surface thereof dissociated masses of material of high specific gravity adapted to give weight to the ball, and also to protect the pressure-resisting layer from injury by a blow; and an outer protective layer of suitable elastic material.

In testimony whereof I have signed my name to this specification in the presence of two witnesses.

HOWARD DORRANCE DAY.

Witnesses:
GEORGE T. BAKER,
NATHAN H. BAKER.