

July 5, 1932.

A. E. PENFOLD

1,865,481

TENNIS BALL AND THE LIKE

Original Filed Dec. 6, 1924

2 Sheets-Sheet 1

Fig. 1.

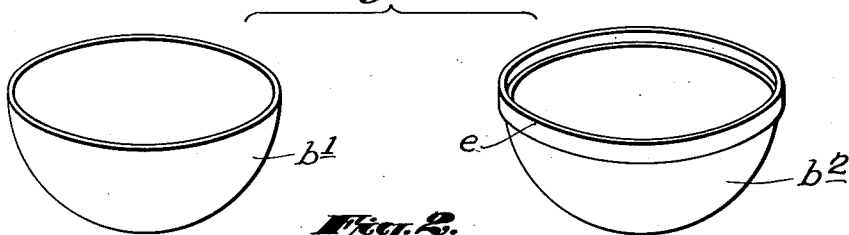


Fig. 2.

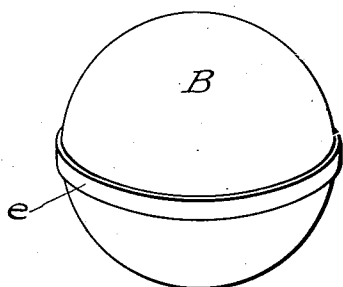


Fig. 7.

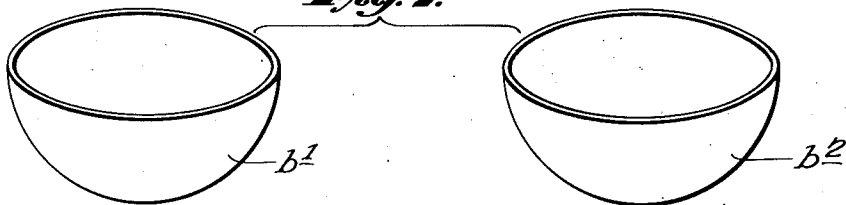
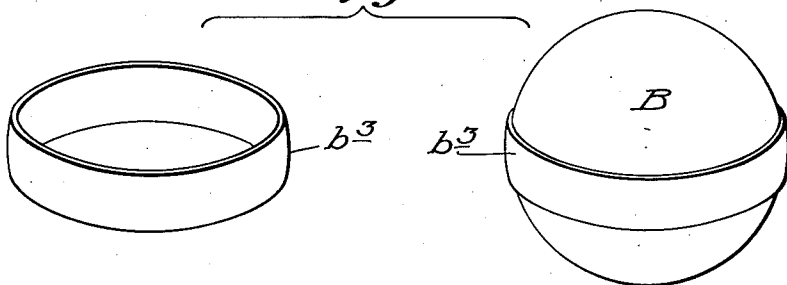


Fig. 8.



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Fig. 3.

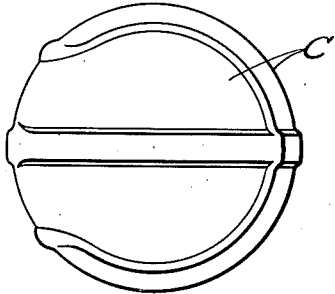


Fig. 4.

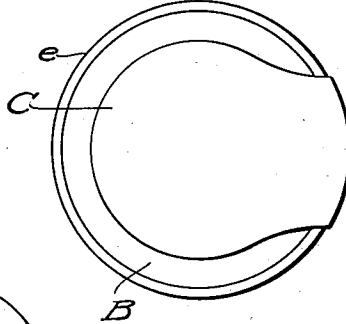


Fig. 5.

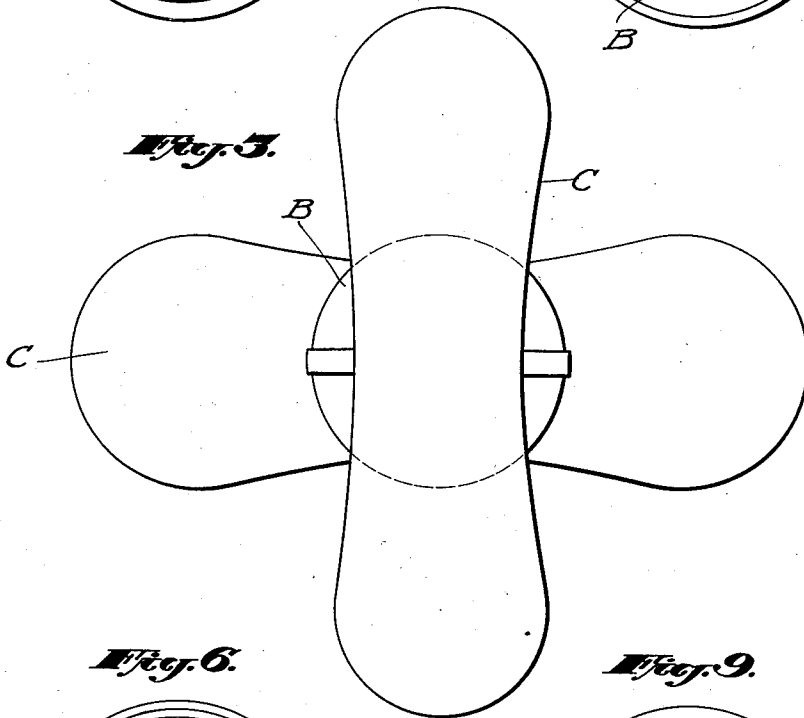


Fig. 6.

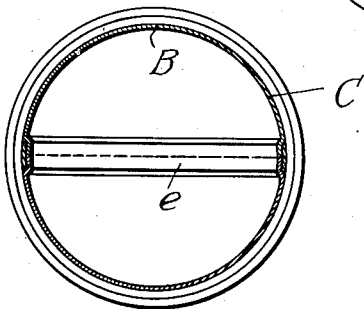
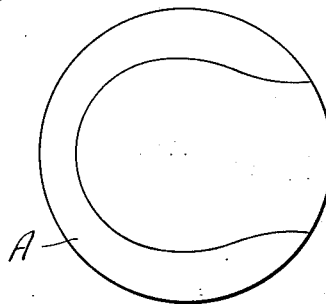


Fig. 9.



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UNITED STATES PATENT OFFICE

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TENNIS BALL AND THE LIKE

Original application filed December 6, 1924, Serial No. 754,263, and in Great Britain March 13, 1924.
Divided and this application filed April 4, 1927. Serial No. 180,952.

This invention relates to balls of the type or description which have a gas content such, for example, as tennis balls described in my copending application Serial No. 754,263 filed December 6, 1924, of which this present application is a division.

The invention will be apparent from the following specification when read in connection with the accompanying drawings in which—

Fig. 1 illustrates two semi-rigid hemispherical cups, one of which is provided with an overlapping ridge;

Fig. 2 illustrates the two semi-rigid hemispherical cups united to form a spherical gas-tight container;

Fig. 3 illustrates the spherical gas-tight container showing a convenient method of attachment of india rubber strips to form a rubber coating on its external surface;

Fig. 4 illustrates the spherical gas-tight container with one strip of rubber affixed to its surface;

Fig. 5 illustrates a spherical gas-tight container coated with rubber and unvulcanized;

Fig. 6 illustrates a section of a rubber coated container after vulcanization;

Figs. 7 and 8 illustrate a modification in which the spherical gas-tight container is composed of two cups joined together by means of a circular strip of the same or similar material as that of which the cups are formed;

Fig. 9 illustrates a ball in which the vulcanized spherical gas-tight container is covered with felt.

A is a tennis ball constructed from a thin hollow sphere B of semi-rigid character such as can be obtained from gutta percha or balata or a rubber mixture containing a proportion of gutta percha and/or balata and inflated to the required degree by the provision therein of a suitable gas. The said hollow sphere B may be coated with a suitable layer of soft rubber laid on in the usual form of strips C, Figs. 3, 4 and 5, and after it has been vulcanized a suitable coating of felt may be applied to form the outer covering of the ball A.

The hollow sphere B is preferably formed

of two hemispherical cups *b1*, *b2*, or it may be formed of two or more component parts comprising two cups. A suitable material from which to form the said component parts of the hollow sphere B is a prepared mixture containing:—

	Per cent by weight
Purified balata.....	25
Washed balata.....	15
Smoked sheet rubber.....	30
Sulphur.....	10
Zinc oxide.....	20

from which all traces of grit or other foreign matter of similar character have been removed.

Such material suitably prepared is preferably moulded in the form of cups *b1*, *b2*, the cup *b1* being of hemispherical shape, whilst the cup *b2* is of similar shape provided with an overlapping ridge *e*. The cup *b1* may be provided with a suitable marking to indicate when it is properly seated upon the inside of the overlapping ridge *e*.

A convenient method of moulding the cups *b1*, *b2*, is to extrude the material or dough containing gutta percha and/or balata of which they are formed in a condition in which it is softened under gentle heat, into cord form, and whilst the cord is maintained in a soft plastic state, to cut it into pieces of the correct weight and to place the pieces in warm moulds wherein they are pressed into the desired shape, with the material evenly distributed.

Although the complete spherical gas-tight container may be supplied with gas by injecting the same after vulcanization, I prefer to use a plugless ball inflated by the generation of gas produced from gas producing chemicals within it during the process of vulcanization. Satisfactory results are obtained by placing a mixture of 0.4 grammes of sodium nitrate and 0.4 grammes of ammonium chloride to which mixture three or four drops of water have been added in one of the cups *b1*, *b2*, the rims of which are cleaned with a petroleum spirit or other cleaning solvent and smeared with a solu-

tion of rubber dissolved in petroleum spirit and fitted and joined together.

The cups *b1*, *b2*, or component parts of the spherical container *B*, being of semi-rigid character are conveniently handled during the operations and very little skill on the part of the operative is required to ensure accuracy of manipulation and perfect jointing.

The hollow spherical gas-tight container *B* thus formed is then allowed to stand until the rubber jointing solution is dry when it will be found that both cups *b1* and *b2* have contracted together round the seam, giving a satisfactory joint and producing a semi-rigid container on which to apply when desired a coating of soft rubber, and after vulcanization it will be found that the semi-rigidity of the container has disappeared and under the influence of the inflation gas has become extremely resilient.

In making the shells *b1*, *b2*, and after vulcanizing the container *B*, it is necessary to thoroughly cool the mould before the articles are removed therefrom.

This is specially important after vulcanization because the gas content is influenced by changes of temperature, and it is necessary to avoid unrestricted expansion of the gas contained therein under the influence of heat and the consequent production of oversized balls.

As above stated the gas container may be before or after vulcanization be coated with a covering of rubber applied in any convenient manner when desired.

A suitable covering of felt or other material may be applied to the outer surface of the container when desired in any convenient manner.

In Figs. 7 and 8 I have illustrated a modification in which the container is constructed of three component parts comprising two cups *b1*, *b2*, with an intermediate piece *b3*.

Tennis balls constructed according to my invention and as herein described possess great resiliency, are extremely durable and offer great resistance to wear. Moreover by their construction and the method thereof they can be manufactured by unskilled operatives so as to retain their inflation gas thus reducing to a minimum the very large proportion of rejects which has hitherto been inseparable from the production of tennis balls and they can be relied upon not to deteriorate during the time they are stored between manufacture and use.

Though I have described with great particularity of detail certain embodiments of my invention, yet it is not to be understood therefrom that the invention is restricted to the particular embodiments disclosed. Various modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is:

1. A tennis ball gas container comprising component parts of non-porous, non-rigid material composed of a rubber mixture containing a substantial percentage of a gum such as gutta percha or balata.

2. A tennis ball gas container comprising component parts of non-porous, non-rigid material composed of approximately 30 percent by weight of rubber, 25 percent by weight of purified balata and 15 percent of washed balata.

3. A tennis ball gas container comprising component parts of non-porous, non-rigid material composed of a rubber mixture containing a substantial percentage of a gum such as gutta percha or balata, said parts being joined together with a gas-tight joint.

4. A gas container for tennis balls composed of parts of non-porous, non-rigid material joined together with gas-tight joints, said non-rigid material being composed of an india rubber mixture containing at least 25 percent by weight of a gum such as gutta percha or balata.

5. A tennis ball comprising a gas container made in accordance with claim 1, molded and vulcanized and provided with an outer covering of felt or the like.

6. A tennis ball comprising a gas container as defined in claim 2, and molded and vulcanized and provided with an outer covering of felt or the like.

7. A gas filled container of the type described which comprises walls having component parts of non-porous, non-rigid material composed of a rubber mixture containing substantial percentages of a gum such as gutta percha or balata, and having a coating of soft rubber.

8. A gas filled container of the type described having walls comprising a vulcanized mixture of rubber and balata in proportions of approximately the same magnitude.

9. A tennis ball comprising a relatively thin walled hollow gas filled container composed of a mixture of rubber and balata, in proportions of substantially or approximately the same magnitude and a relatively thicker covering of rubber vulcanized thereto.

10. A tennis ball comprising a relatively thin walled hollow gas filled container composed of two parts united by a gas-tight joint, said parts being composed of a mixture of rubber and balata with a small percentage of a vulcanizing agent incorporated therein, and a relatively thicker layer of rubber comprising separate pieces vulcanized to said container with their joints displaced relatively to the joint between the parts of the container.

In witness whereof, I have hereunto signed my name.

ALBERT ERNEST PENFOLD.