

Nov. 12, 1940.

W. J. VOIT ET AL

2,221,534

METHOD OF MAKING ATHLETIC BALLS

Original Filed Nov. 6, 1937

2 Sheets-Sheet 1

Fig. 1.

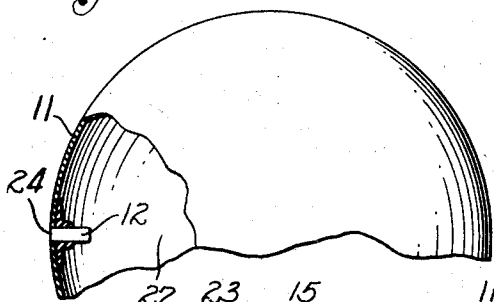


Fig. 2.

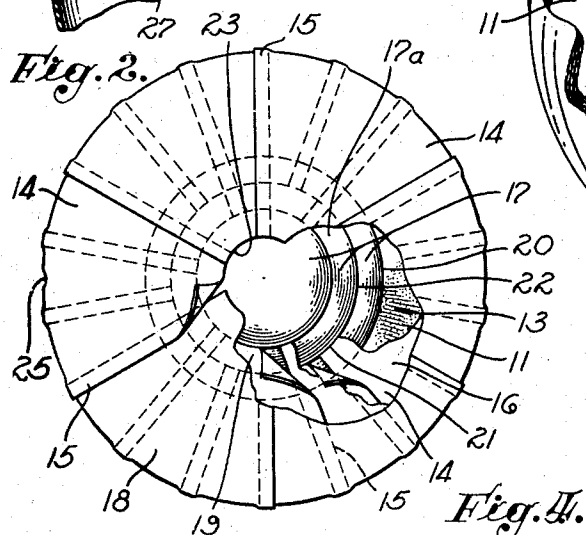


Fig. 4.

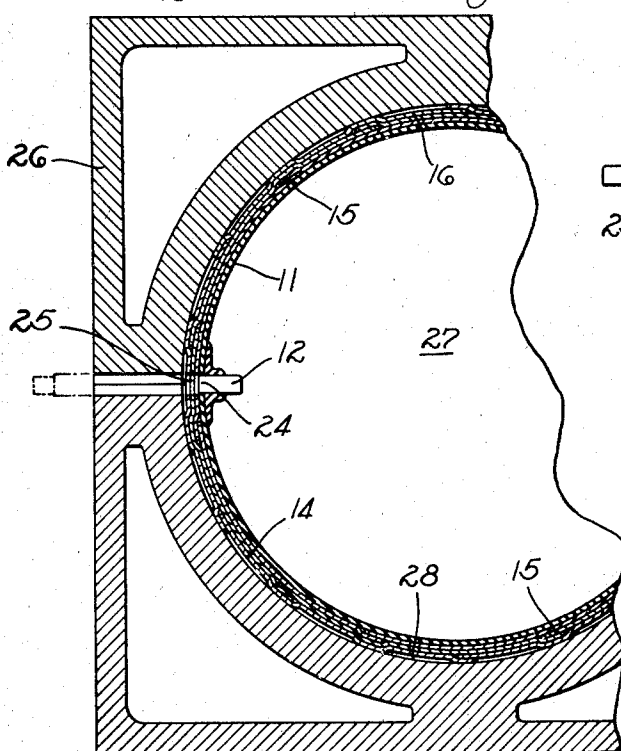


Fig. 3.

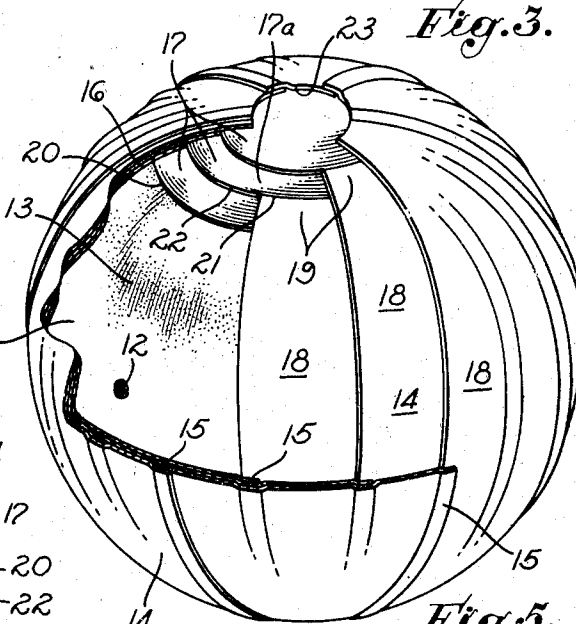
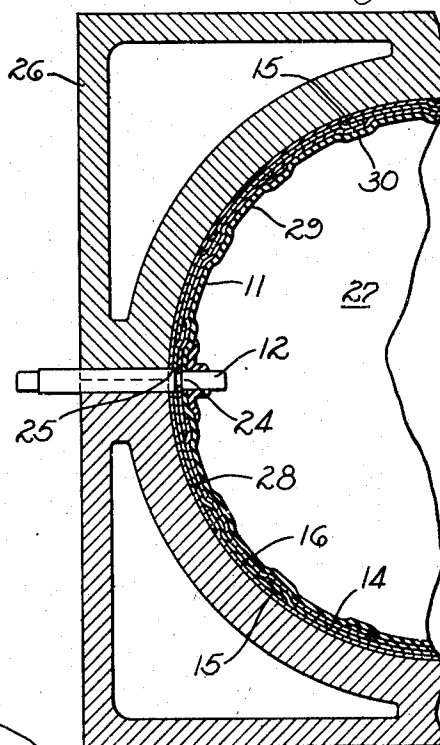


Fig. 5.



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2 Sheets-Sheet 2

Fig. 6.

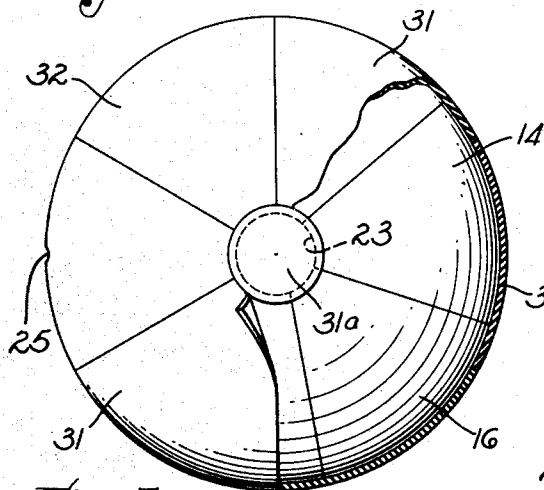


Fig. 7.

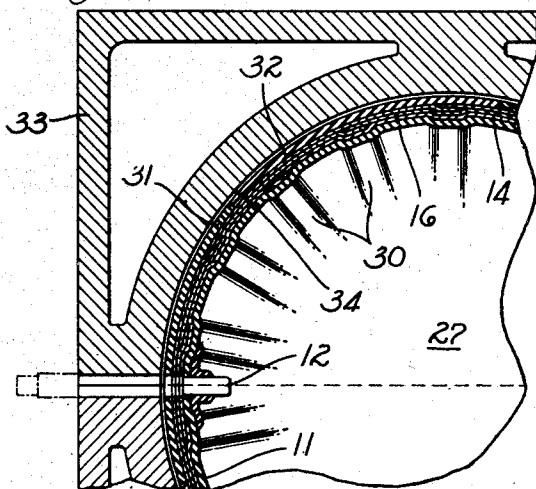


Fig. 8.

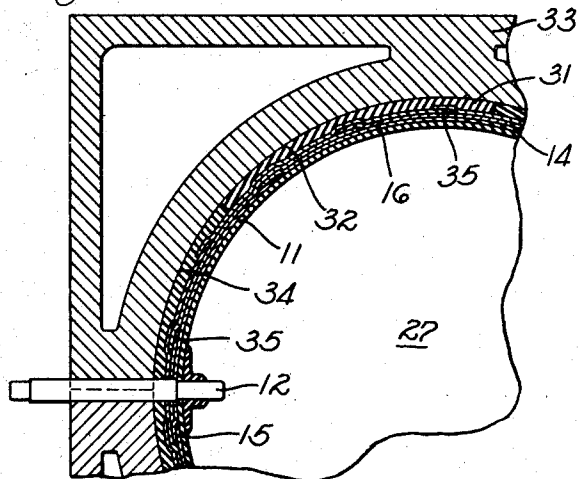


Fig. 9.

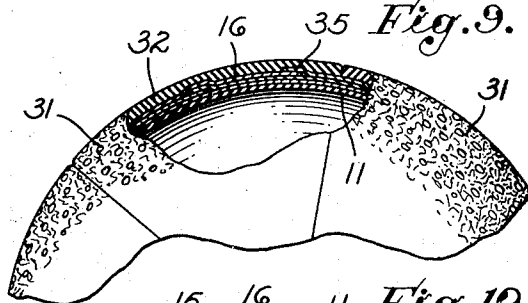


Fig. 10.

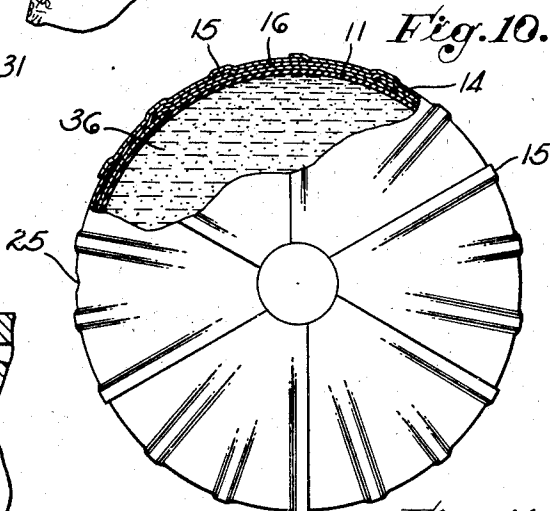
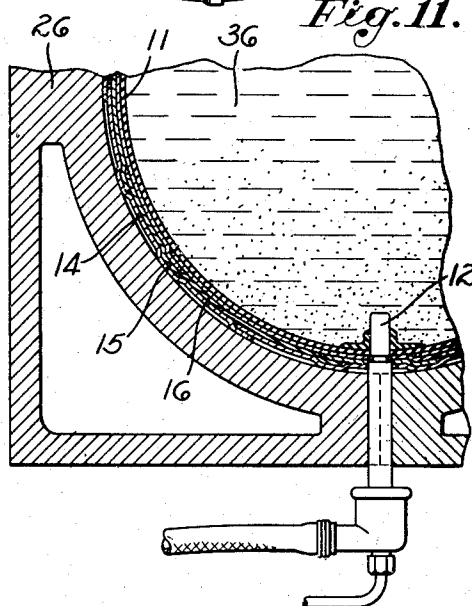


Fig. 11.



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METHOD OF MAKING ATHLETIC BALLS

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Original application November 6, 1937, Serial No.
173,158. Divided and this application April 19,
1939, Serial No. 268,682

20 Claims. (Cl. 154—16)

This application is a division of our application
Serial No. 173,158, for an Athletic ball.

This invention relates to a method of making
inflatable athletic balls.

5 It relates particularly to a method of making
that class of inflatable athletic balls which com-
prise a central bladder to provide a means of in-
flation, an intermediate wall of relatively non-
stretchable material, to give the ball a definite
10 size and shape, and an outer protective covering
of rubber, leather or other material, to resist
surface abrasion and wear. While some features
of our invention are usable for making balls with
any type of outer cover or with no cover, we
15 prefer to provide an outer cover of rubber, which
not only resists surface wear, better than leather
or other materials, but provides a water-proof
casing for the ball, which prevents the entrance
of water, dirt and other deleterious matter into
20 the substance of the intermediate layer, where
such foreign matter would cause decay and me-
chanical destruction, with resultant disintegra-
tion of the material of this intermediate layer.

One of the objects of our invention is to provide
25 a method of making athletic balls of this type,
which shall be rapid in operation, economical of
the time of the factory operatives, and shall re-
quire a minimum of mechanical equipment.

In these athletic balls it is desirable to provide
30 an intermediate relatively non-stretchable wall
which shall be composed of a plurality of seg-
ments, facilitating accurate conformation of the
wall to the central bladder, which segments shall
be firmly united into one continuous wall capable
35 of transmitting stresses in every direction
throughout its entire extent.

Another object of our invention is to thus firmly
unite these segments by the use of marginal
seams, and to so dispose these seams that they
40 will not cause the ball to have uneven elasticity,
will not deform the outer surface of the ball with
ridges or other objectionable deviations from true
shape, and will act to prevent relative circum-
ferential displacement of the outer cover and in-
45 termediate layer.

Another object of our invention is to provide a
method of making a ball of this type, in which
the intermediate layer is so fabricated that it will
almost completely resist stretching stresses.
50 When the ball is inflated, the intermediate fabric
layer will, because of this resistance to stretching
stresses, prevent the ball from becoming larger
than the size established by the regulations of
the game for which the ball is designed. And
55 this same resistance to stretching stresses will

prevent the ball from being deformed by heavy
blows against floor, walls, or other objects, and
will lengthen its life.

Another object of our invention is to provide a
method of making a ball which shall be readily
5 inflatable, will not stretch, will resist surface
wear, be water-proof, and have no surface seams,
ridges or irregularities, and which shall in com-
bination with these several attributes, be char-
acterized by a continuous, integral webwork of
10 vulcanized rubber from inner surface to outer
surface, binding the entire structure together in
a flexible whole, but yet in such a manner as to
prevent relative movement of its component
parts, and the resulting "breakdown" of the walls
15 of the ball which occurs when adjoining particles
begin such a relative movement.

Another object is to provide a method of mak-
ing balls of this type, which makes possible a
rapid and workmanlike application of the seg-
20 ments of a one-piece rubber cover to the inter-
mediate fabric layer prior to molding the cover
on the ball which object is attained by providing
a fabric layer with a smooth surface without
ridges or other elevations. Other features and
25 advantages of our invention will appear from a
reading of the specification and drawings, and
will be presented in the claims.

In the drawings:

Fig. 1 is a fragmentary elevational view, partly
30 in section of the central bladder.

Fig. 2 is an elevational view of the partly fin-
ished ball, showing the manner of applying the
fabric segments of the intermediate wall, with
some of the segments broken away to more clearly
35 disclose the construction.

Fig. 3 is a perspective view of the partly fin-
ished ball, showing it at the same stage of con-
struction as that of Fig. 2, and also with some of
the segments of the intermediate wall broken
40 away.

Fig. 4 is a fragmentary sectional view of the
partly finished ball of Figs. 2 and 3 and the mold
in which it has been placed, and before the ap-
45 plication of internal pressure.

Fig. 5 is a showing similar to that of Fig. 4, but
after the application of internal pressure.

Fig. 6 is an elevational view showing the meth-
od of applying the segments of the outer rubber
cover to the partly finished ball, some of the seg-
50 ments being broken away to more clearly disclose
the construction.

Fig. 7 is a fragmentary sectional view of the
ball with the segments of the rubber cover in
place, and with the ball in position in a second
55

mold, but prior to the application of internal pressure.

Fig. 8 is a showing similar to that of Fig. 7, but after the application of internal pressure.

Fig. 9 is a fragmentary elevational view of the completed ball, partly in section.

Fig. 10 is an elevational view of a partly finished ball, shown partly in section, illustrating the use of alcohol as a forming filler for the bladder during the manufacturing process.

Fig. 11 is a sectional elevational view of the partly finished ball of Fig. 10 after being placed in a mold.

For reference purposes it is convenient to speak of the poles and the equatorial region of the athletic ball. In all of the figures of the drawings, except Fig. 3, the polar axis of the ball is a horizontal line perpendicular to the plane of the drawing sheet, and the equatorial line appears as a bounding great circle or an arc of a great circle, according to whether the view is complete or fragmentary. In Fig. 3 one of the poles is shown near the top of the figure. While the ball depicted in the drawings is spherical, our invention is equally applicable to athletic balls which are either elliptical in longitudinal cross section, or of some other shape suitable to the purpose for which they are designed. Whenever words applicable to a spherical ball appear in this description, it will be understood that it is for convenience of description only, and that corresponding words applicable to some other shape may be substituted throughout.

We first make in accordance with standard methods a thin walled rubber bladder 11 having a shape when inflated like that of the finished ball, and provide it with an air check valve 12 of the type usually used for this purpose. Through this valve we then admit air or any other suitable gas under pressure, and inflate the bladder until it reaches a size slightly less than that desired for the completed ball. The bladder is next completely coated with a rubber cement 13 by dipping the bladder in a bath of the cement or in any other suitable manner. Pieces or segments 14 of relatively non-stretchable rubberized fabric, commonly known as "friction fabric" are then applied to the cement coated bladder to form a continuous and complete layer or wall 16 on the exterior surface of the bladder. These pieces of fabric may be cut and applied in any one of a number of ways to present any one of a number of different patterns. And they may be applied in one or more thicknesses, as may be required to meet the conditions of any particular problem of ball design. But whatever the pattern of application or the number of thicknesses, we have found it preferable to give the several pieces a shape and size such that their meeting edges overlap to form thickened seams 15. The underface of the overlapping edge of one piece is preferably treated with rubber cement to cause it to adhere to the outer surface of the edge of the adjacent piece beneath it. When the pieces or segments, to complete one thickness of the fabric wall, have been applied the ball is again given a coating of rubber cement, and the pieces constituting the next thickness placed in position.

Figs. 2 and 3 illustrate a preferred construction of the wall 16. Three thicknesses are shown, each comprising a circular polar piece or segment 17, and longitudinal segments 18. Each of these longitudinal segments overlaps correspond-

ing polar pieces 17 at its two ends, respectively, and each longitudinal segment overlaps along one of its longitudinal edges, the next adjacent longitudinal segment, to form a seam 15. When the layer is made up of more than one thickness, we preferably extend the overlapping end 19 of each longitudinal segment beyond the circular edge 20 of its corresponding polar cap segment 17 to form a butt joint at 21 with the circular edge 22 of the next outer polar cap segment 17a. The polar edges 23 of the outermost layer of longitudinal fabric segments may be for ease of manufacture disposed a short distance away from the pole of the ball, and the small circle bounded by these edges may be left unfilled by any fabric segment. That longitudinal segment or segments which are applied over the end 24 of the valve 12 are each provided with a small aperture 25 registering with the valve in the bladder.

After the one or more layers of rubberized fabric constituting the wall 16 have been placed in position upon the bladder, the ball with outwardly projecting seams 15, is put in a mold 26 of spherical shape, and of which the size is slightly less than that of the finished ball. As will be seen from an inspection of Fig. 4 of the drawings, the inner face of the mold is spaced from those portions of the outer surface of the outer layer of segments 18 which are between the seams 15. Air or other gas is then forced through the valve 12 into the interior chamber 27 of the bladder 11, and a pressure applied sufficient to force the wall 16 at all points of its outer surface into intimate contact with the inner face 28 of the mold. In practice it has been found that a pressure of approximately ninety pounds per square inch is required for this purpose. Those portions of the outer surface of the wall 16 between the seams 15 are raised until flush with the outermost portions of the seams, which thus disappear as features of the outer surface of the wall 16. At the same time, as shown in Fig. 5, ribs or seams 30 appear on the inner surface 29 of the bladder. At this juncture sufficient heat is applied to the mold, and for a sufficient time, to partially vulcanize the rubber component of the fabric segments 14 and the rubber cement used in assembling these segments. This heat partially hardens the rubber and fixes in rigid position the ribs 30 which project inwardly of the bladder wall.

The ball is then deflated and removed from the mold. While we prefer at this stage to apply a protective cover of rubber or other material, the process of manufacture as so far described may be employed to produce a completed ball, in which case the wall 16 becomes the outer wall of the ball. For some types of use and if the wall 16 is made of proper materials, an athletic ball without an additional protective wall may give satisfactory performance.

When the ball is to be provided with a rubber cover, it is, after removal from the mold 26 re-inflated, sufficiently to give it that degree of rigidity desirable for the next step in the process of manufacture. This step consists of the application of pieces or segments 31 of unvulcanized rubber. We prefer to cut six longitudinal segments 31 and one circular polar segment 31a. The ball is first coated with rubber cement, by dipping or otherwise, and the segments 31, 31a applied and fitted upon the outer surface of the wall 16. The segments are so designed and cut that they fit together with butt joints to com-

pletely cover the wall 16 in one continuous rubber layer or wall 32. Fig. 6 shows the pattern according to which we prefer to apply these segments 31 and 31a.

5 The ball is then placed in the second mold 33, as shown in Fig. 7. This mold is, like mold 26, of the shape of the finished ball, and is also of the same size as that of the finished ball. As will be seen from an inspection of Fig. 7 of the
10 drawings, the inner face of the mold is spaced from the outer surface of the wall 32. Air or other gas is then forced through the valve 12 into the interior chamber 27 of the bladder 11, and a pressure applied sufficient to force the wall
15 32 at all points of its outer surface into intimate contact with the inner face 34 of the mold. At the same time the intermediate wall 16 and the bladder 11 are pressed outwardly, the wall 16 against the rubber wall 32, and the bladder
20 against the wall 16. The wall 16 as it moves outwardly is stretched. When a sheet of rubberized fabric, such as that used in making the wall 16, is stretched by tensile stresses applied longitudinally of the sheet, seam ridges, such as
25 those at 30, tend to disappear and corresponding seam ridges tend to appear on the opposite face of the sheet. In accordance with this principle, when a pressure of approximately ninety pounds is applied within the ball, when in position in
30 the mold 33, the ridges 30 tend to disappear and corresponding ridges 35 appear on the outer surface of wall 16. The ridges 30 are also flattened out, and the ridges 35 correspondingly produced on the outer face of wall 16 by the direct effect
35 of pneumatic pressure acting radially outward. Fig. 8 shows the ball after the application of pressure to it in the mold, and in that figure the inner face of the bladder 11 and wall 16 are shown as smooth, and ridges 35 are shown projecting outwardly into the material of the rubber
40 cover 32. Heat is then applied to the mold 33 to vulcanize the rubber of the bladder, of the cement, of the fabric wall 16, and of the rubber cover 32, which unites into one flexible whole
45 the several elements of the ball, with the elements disposed as shown in Fig. 8. The material of the segments of the rubber cover becomes plastic when heated and forms itself with a smooth exterior surface and an interior surface
50 conforming to the outer surface of the wall 16, and is then hardened in that position. The ridges 35 are fixed in the position they assumed when the ball was subjected to the pressure of inflation, and become permanently embedded in
55 the wall 32 of the rubber cover. After vulcanization is completed the ball is deflated and then removed from the mold 33, completed and ready for use.

60 The inner surface of the mold 33 may be engraved to imitate the grain and seams of the covering of a regulation leather covered football or basketball and the design will then appear on the exterior surface of the ball.

65 Inflatable rubber balls have been heretofore produced with seams and grain imitative of the exterior surface of a leather covered ball, but the walls of these balls have not been provided with a fabric constituent or any other reinforcing means to prevent the stretching or other deformation of the outermost rubber layer which
70 is formed with these imitative marks. As a result, when the ball has become stretched or locally deformed, the imitative marks have been correspondingly distorted and given an unreal

appearance, which destroys the simulation of a leather covered ball.

The ball as completed presents no ridges or seams on its outer surface. The ridges 35 embedded in the rubber cover 32 act to key together
5 the two walls 16 and 32, and prevent relative circumferential displacement. That feature of our method of making our athletic ball, by which the lapped seams project alternately, first outwardly, then inwardly, and again outwardly in
10 the completed ball, presents several advantages. It makes possible rapid assembly of wall 16 on the bladder, which would be impossible were it necessary to fit the segments of wall 16 together with butt joints. It affords a better union of
15 the segments of wall 16 into a single continuous sheet for the transmission of stresses in all directions throughout the surface of the wall, than would be the case with butt joints. It affords a smooth surface on the unfinished ball for the
20 rapid application of the segments of the rubber cover.

The wall 16 serves the primary purpose of preventing the walls of the ball from stretching out of shape or to an undesirable size. For that
25 reason they are made of fabric material. In our process this fabric material is twice subjected to a heavy internal pressure of inflation which stretches it in advance of the use of the ball for play purposes, since the mold used in conjunction
30 with each application of internal pressure is larger than the ball structure placed within it. Each time that it is subjected to this stretching action the fibers of the material become tensionally deformed and less liable to further elonga-
35 tion when subjected to the stresses arising during the use of the ball. Also at the time of each stretching, the rubber constituent of the fabric material is given a degree of vulcanization, which tends to strengthen the fabric material
40 against further elongation.

Figs. 10 and 11 illustrate a modification of our method of making an athletic ball. The bladder 11 is placed in a mold and filled with an alcohol
45 which has a temperature of liquefaction somewhere between normal atmospheric temperatures and the temperature of vulcanization. Cetyl alcohol, ceryl alcohol, or mericyl alcohol has such a melting point. An alcohol of this type is melted and injected into the bladder, while in a mold.
50 The alcohol is then cooled until it solidifies, and the bladder, now filled with a solid substance, is removed from the mold. The solid alcohol gives a relatively unyielding form to the bladder upon which the segments of the wall 16 can be readily
55 applied. Fig. 10 shows the bladder 11 filled with solid alcohol 36, and shows the segments 14 of the wall 16 applied to the bladder ready to be placed in the first vulcanizing mold 26. Fig. 11 shows the unfinished ball in the mold before the appli-
60 cation of additional pressure. Heat is now applied sufficient to melt the alcohol, but not sufficient to vulcanize the rubber constituents of the ball. Additional hot liquid alcohol is injected, and the pressure within the bladder raised to ap-
65 proximately ninety pounds. From this point, the process of manufacturing the ball is continued as heretofore described, except that each time deflation or inflation is required, the temperature of the ball and alcohol must be between the liquefaction point of the alcohol and the vul-
70 canization point of the rubber, and each time wall segments are to be applied, the temperature of the alcohol and ball should be below the liquefaction point of the alcohol.

Where two successive applications of layers or walls are made to the form, the second high pressure inflation applied while the ball is in the second mold can be made by the use of air or other gas, instead of by the injection of additional liquid alcohol, since there is no subsequent step in the process for which a solid form is needed. It is also apparent that two or more outer walls or layers of material can be applied successively to the solid form without any intermediate step of vulcanization, and all the walls vulcanized upon the form at one operation. The high pressure inflation imparted prior to vulcanization can in that case also be effected by the injection of either air or liquid alcohol. Similarly, when the completed ball is to have but one layer of material, this one layer can be applied to the solid form, and the high pressure applied during the molding operation can be attained by the use of alcohol or air. It is even possible, when two or more layers or walls are applied to the form and each layer is separately subjected to the molding and vulcanizing operation, to use air to effect the high pressure required to force the ball material against the inner surface of the mold, during the first of such molding and vulcanizing operations, provided all of the air is later removed from the ball, before the material of the second wall is applied to the form. Otherwise, the presence of air as well as alcohol within the ball will cause the core form to have an imperfect shape, with depressions or other deformations, due to air pockets in the solid alcohol. In the preferred succession of steps which we have described, which comprises two applications of material and two vulcanizing operations, we can vary our method of using the alcohol by removing all the alcohol from the ball after the first vulcanizing operation and relying solely on air pressure, subsequently applied, to give the ball the requisite rigidity for the application of the segments of the outermost wall.

We may omit the use of a central bladder entirely in that modification of our process which involves the use of alcohol to provide a solid form upon which to build up the wall or walls of the ball. In that case, we may form the solid core of alcohol in a suitable mold and rely on the materials in the one or more walls of the ball to retain the alcohol or both alcohol and air injected into the ball during the manufacturing process. While we have referred to alcohol of the physical qualities above recited as one material which may be used in our modified method of manufacture, it is obvious that other materials are also adapted to meet the conditions of our process. We can mention as examples of such other materials, paraffine, wax, and ordinary water ice.

While we have shown and described one particular method of making an athletic ball and several modifications thereof which embody our invention, we do not wish to be limited to the particular method and modifications herein described, but desire to include in the scope of our invention the features of novelty substantially as set forth in the following claims.

We claim as our invention:

1. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber ball of smooth contour; applying an outer layer thereto comprising some vulcanizable material, said outer layer being applied in overlapping segments, the lapped edges of said segments presenting outwardly projecting seams; placing said

ball in a mold; applying internal pressure to said ball to force said outer layer against the walls of said mold and to invert inwardly said seams; curing said ball in said mold; releasing said internal pressure; and removing said ball from said mold.

2. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber ball of smooth contour; applying an outer layer thereto comprising some vulcanizable material, said outer layer being applied in overlapping segments, the lapped edges of said segments presenting outwardly projecting seams; placing said ball in a mold; applying internal pressure to said ball to force said outer layer against the walls of said mold and to invert inwardly said seams; curing said ball in said mold; releasing said internal pressure; removing said ball from said mold; and applying a protective cover to said ball.

3. A method of making an inflatable athletic ball, comprising: forming an unfinished hollow ball with inwardly projecting seams; applying a cover of vulcanizable material to said ball; placing said ball in a mold; applying internal pressure to said ball and thereby forcing said seams outwardly into said vulcanizable material; and vulcanizing said cover on said ball.

4. A method of making an inflatable athletic ball, comprising: forming an unfinished ball comprising some vulcanizable material and with outwardly projecting seams on its outer surface; placing said ball in a first mold; applying internal pressure and heat to said ball to partially cure said ball with its outer surface smooth and with said initially outwardly projecting seams now projecting inwardly; removing said ball from said first mold; applying a cover of vulcanizable material; placing said ball in a second mold; and applying internal pressure and vulcanizing heat to said ball to force the seams outwardly into the material of the cover and to permanently embed them therein.

5. A method of making an inflatable athletic ball, comprising: making a form having the shape of the finished ball; applying a layer of segments of sheeted material having a vulcanizable constituent to said form with adjacent segment edges lapped to present outwardly extending seams; placing the unfinished ball in a first mold of the shape of the finished ball; applying internal pressure to said ball to force said layer of segments against the walls of said first mold; partially vulcanizing said ball while it is subjected to said pressure whereby the exterior surface of said unfinished ball becomes smooth and the interior surface presents inwardly projecting seams; releasing said internal pressure; removing said ball from said first mold; applying a cover to said ball of uncured vulcanizable material; placing said ball in a second and larger mold; applying internal pressure to said ball; and vulcanizing the vulcanizable materials while said pressure is maintained whereby said inwardly projecting seams are forced outwardly into the cover of vulcanizable material and fixedly embedded therein.

6. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber bladder having a fluid valve; injecting fluid into said bladder through said valve until the size of said bladder is slightly less than that of the finished ball; applying a vulcanizable cement to the outer surface of said bladder; applying segments of fabric material to said cement covered

bladder with the meeting edges of said segments lapped to present outwardly projecting seams, said segments forming an outer wall of said ball; placing said ball in a first mold of a size slightly smaller than that of the finished ball; injecting additional fluid into the bladder through said valve so as to force said outer wall of fabric material against the inner face of said first mold and to invert inwardly said outwardly projecting seams; partially vulcanizing said ball; removing some of the fluid from said bladder; removing said ball from said first mold; applying a vulcanizable cement to the outer surface of said fabric wall; applying an uncured rubber cover to said cement covered ball; placing said ball in a second mold of the size of the finished ball; injecting additional fluid into said bladder through said valve so as to force said rubber cover against the walls of said second mold and to stretch said fabric wall and force said fabric wall outwardly against said rubber cover and to extrude the seams of said fabric wall outwardly and embed said seams in said rubber cover; vulcanizing said ball; removing some of the fluid from said bladder; and removing the finished ball from said second mold.

7. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber bladder; inflating said bladder to a size slightly smaller than that of the finished ball; coating the exterior surface of said bladder with rubber cement; applying to said cement coated bladder a plurality of segments of rubberized fabric with lapped meeting edges to form an outer wall upon the bladder with outwardly projecting seams; partially vulcanizing the unfinished ball under pressure of additional inflation in a first mold of a size approximately that of said unfinished ball whereby said unfinished ball is caused to have a smooth exterior surface and inwardly projecting seams; deflating and removing said ball from said first mold; coating the outer surface of said fabric wall with rubber cement; applying an uncured rubber cover to said cement coated fabric wall; vulcanizing said unfinished ball in a second mold of the size of the finished ball under pressure of additional inflation whereby said previously inwardly projecting seams are forced outwardly and permanently embedded in said rubber cover; and deflating and removing from said second mold the finished ball.

8. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber bladder; inflating said bladder with liquid alcohol in a first mold to a size slightly smaller than that of the finished ball, said liquid alcohol having a liquefaction point above normal atmospheric temperatures but below the temperature of vulcanization; cooling said alcohol to a temperature below its liquefaction point and removing said bladder from said mold; coating the exterior surface of said bladder with rubber cement; applying to the cement coated bladder a plurality of segments of rubber fabric with lapped meeting edges to form an outer fabric wall upon said bladder with outwardly projecting seams; partially vulcanizing the unfinished ball under pressure of additional inflation in a second mold of a size approximately that of the unfinished ball whereby the unfinished ball has a smooth exterior surface and inwardly projecting seams; deflating and removing said ball from said second mold; coating the outer surface of said fabric wall with rubber cement; applying an uncured rubber cover to the said cement coated

fabric wall; vulcanizing the unfinished ball in a third mold of the size of the finished ball under pressure of additional inflation whereby said previously inwardly projecting seams are forced outwardly and permanently embedded in said rubber cover; and deflating and removing from said third mold the finished ball.

9. A method of making an inflatable athletic ball, comprising: making an inflatable central rubber form in the shape desired for the finished ball; inflating said form to a size slightly less than that of the finished ball; coating said form with rubber cement; applying a layer of segments of rubberized fabric material to said form with the edges of each segment lapped with respect to the edges of adjacent segments to present outwardly projecting seams; placing said form and fabric layer in a first mold of a size slightly less than that of the finished ball; additionally inflating said form as to increase the internal pressure and force said fabric segments into contact with the walls of said first mold and eliminate said outwardly projecting seams and form corresponding inwardly projecting seams; applying sufficient heat for a sufficient time to partially vulcanize said form, said fabric material, and said cement; deflating said ball; removing said ball from said first mold; partially re-inflating said ball; applying a coating of rubber cement to said ball; applying a layer of segments of rubber with butt joints to form a complete rubber cover for said ball; placing said ball in a second mold of the size of the finished ball; additionally inflating said ball to force the several elements of the ball outwardly toward the wall of said second mold, thereby eliminating said inwardly projecting seams and forming corresponding seams projecting outwardly into said rubber cover; vulcanizing said ball with heat; deflating said ball; and removing said ball from said second mold.

10. A method of making an inflatable athletic ball, comprising: making a solid form of a material having a liquefaction point above normal atmospheric temperature but below the temperature of vulcanization, said form having the shape of the finished ball; forming a hollow ball-shaped wall on said form of which the material has a vulcanizable constituent; applying heat sufficient to raise said ball to the temperature of vulcanization and to liquefy said form material and maintaining said temperature a sufficient time to vulcanize said constituent; and removing said liquid form material before said form material and ball are cooled from said temperature of vulcanization below the temperature of liquefaction of said form material.

11. A method of making an inflatable athletic ball, comprising: making a solid form of a material having a liquefaction point below the temperature of vulcanization, said form having the shape of the finished ball; forming on said form while at a temperature below its point of liquefaction, a hollow ball-shaped wall of which the material has a vulcanizable constituent; applying heat sufficient to raise said ball to the temperature of vulcanization and to liquefy said form material and maintaining said temperature a sufficient time to vulcanize said constituent; and removing said form material before said form material and ball are cooled from said temperature of vulcanization below the temperature of liquefaction of said form material.

12. A method of making an inflatable athletic ball, comprising: forming a hollow ball of fibrous

material having a vulcanizable constituent, said ball being provided with an inflating valve; placing said ball in a mold; applying internal pressure to force said ball outwardly against the inner face of said mold and to stretch said fibrous material; and vulcanizing said vulcanizable constituent while said ball is subject to said internal pressure.

13. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber ball provided with an inflating valve; applying an outer fibrous layer thereto comprising some vulcanizable material; placing said ball in a mold; applying internal pressure to said ball to force said outer layer against the walls of said mold and to stretch said fibrous material; curing said ball in said mold while said fibrous material is stretched; releasing said internal pressure; and removing said ball from said mold.

14. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber ball provided with an inflating valve; applying an outer fibrous layer thereto comprising some vulcanizable material; placing said ball in a mold; applying internal pressure to said ball to force said outer layer against the walls of said mold and to place under tension said fibrous material; curing said ball in said mold while said fibrous material is under tension; releasing said internal pressure; removing said ball from said mold; and applying a protective cover to said ball.

15. A method of making an inflatable athletic ball, comprising: forming a hollow ball comprising fibrous and vulcanizable material and having an inflating valve; applying a cover of vulcanizable material to said ball; placing said ball in a mold; applying internal pressure to said ball and thereby placing said fibrous material under tension; and vulcanizing said cover on said ball while said fibrous material is under tension.

16. A method of making an inflatable athletic ball, comprising: forming a hollow ball comprising some vulcanizable material and some fibrous material and provided with an inflating valve; placing said ball in a first mold; applying internal pressure and heat to said ball to stretch said fibrous material and partially cure said ball while said fibrous material is under tension; removing said ball from said first mold; applying a cover of vulcanizable material; placing said ball in a second mold; and applying internal pressure and vulcanizing heat to said ball to additionally stretch said fibrous material and complete the curing of said ball while said fibrous material is under tension.

17. A method of making an inflatable athletic ball, comprising: making a form having the shape of the finished ball; applying a layer of fibrous material having a vulcanizable constituent to said form; placing the ball in a first mold of the shape of the finished ball; applying internal pressure to said ball to force said layer of fibrous material against the walls of said first mold, and to place the said fibrous material under tension; partially vulcanizing said vulcanizable constituent of said fibrous material of said ball while said ball is subjected to said pressure and said fibrous material is under tension; releasing said internal pressure; removing said ball from said first mold; applying a cover to said ball of uncured vulcanizable material; placing said ball in a second and larger mold; applying internal pressure to said ball to place the said fibrous material under additional tension; and vulcanizing the vulcanizable

materials of said ball while said pressure is maintained whereby said fibrous material is embedded in said vulcanizable materials and given a permanent set.

18. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber bladder having a fluid valve; injecting fluid into said bladder through said valve until the size of said bladder is slightly less than that of the finished ball; applying a vulcanizable cement to the outer surface of said bladder; applying a layer of rubberized fibrous material to said cement covered bladder, said fibrous material forming an intermediate wall of said ball; placing said ball in a first mold of a size slightly smaller than that of the finished ball; injecting additional fluid into the bladder through said valve so as to force said intermediate wall of fibrous material against the inner face of said first mold and to place said fibrous material under tension; partially vulcanizing said ball while said fibrous material is under tension; removing fluid from said bladder; removing said ball from said first mold; applying a vulcanizable cement to the outer surface of said fibrous wall; applying an uncured rubber cover to said cement covered ball; placing said ball in a second mold of the size of the finished ball; injecting additional fluid into said bladder through said valve so as to force said rubber cover against the walls of said second mold and to further stretch said fibrous wall and force said fibrous wall outwardly against said rubber cover; vulcanizing said ball while said fibrous wall is under tension; removing some of the fluid from said bladder; and removing the finished ball from said second mold.

19. A method of making an inflatable athletic ball, comprising: forming an inflatable rubber bladder provided with an inflating valve; inflating said bladder to a size slightly smaller than that of the finished ball; coating the exterior surface of said bladder with rubber cement; applying to said cement coated bladder a layer of rubberized fibrous material to form an intermediate wall upon the bladder; placing the ball in a first mold slightly larger than said ball; additionally inflating said ball; vulcanizing said ball while inflated whereby said fibrous material is vulcanized under fatigue; deflating and removing said ball from said first mold; coating the outer surface of said fabric wall with rubber cement; applying an uncured rubber cover to said cement coated fibrous wall; placing said ball in a second mold of the size of the finished ball; additionally inflating said ball whereby said fibrous material is additionally stretched; vulcanizing said ball whereby said fibrous material is vulcanized a second time under fatigue; and deflating and removing from said second mold the finished ball.

20. A method of making an inflatable athletic ball, comprising: making an inflatable central rubber form in the shape desired for the finished ball and provided with an inflating valve; inflating said form to a size slightly less than that of the finished ball; coating said form with rubber cement; applying a layer of rubberized fibrous material to said form; placing said form and fibrous layer in a first mold of a size slightly less than that of the finished ball; additionally inflating said form so as to increase the internal pressure and force said fibrous material into contact with the walls of said first mold and stretch said fibrous material; applying sufficient

heat for a sufficient time to partially vulcanize said form, said rubberized fibrous material, and said cement; deflating said ball; removing said ball from said first mold; partially re-inflating
5 said ball; applying a coating of rubber cement to said ball; applying a layer of segments of rubber with butt joints to form a complete rubber cover for said ball; placing said ball in a second mold of the size of the finished ball; additionally inflat-

ing said ball to force the several elements of the ball outwardly toward the wall of said second mold, thereby to further stretch said fibrous material; vulcanizing said ball with heat; deflating said ball; and removing said ball from said second
5 mold.

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