

Nov. 15, 1927.

1,649,734

F. T. ROBERTS ET AL

METHOD OF MAKING INFLATED BALLS

Filed April 16, 1923

3 Sheets-Sheet 1

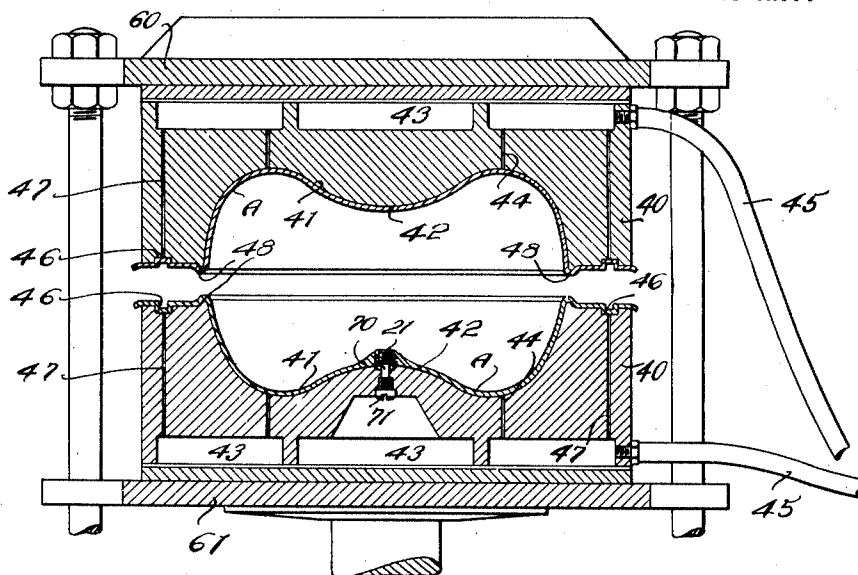


FIG. 1

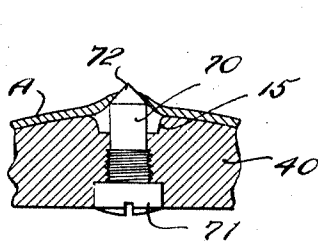


FIG. 2

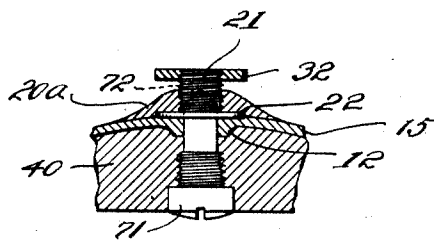


FIG. 3

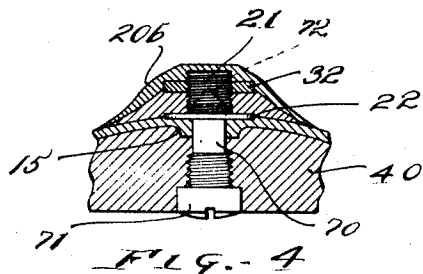


FIG. 4

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FIG. 5

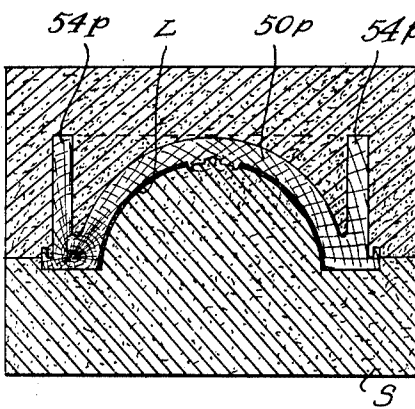
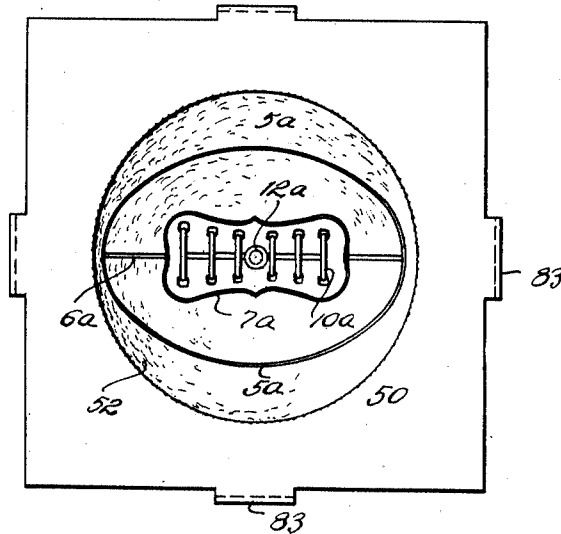


FIG. 6

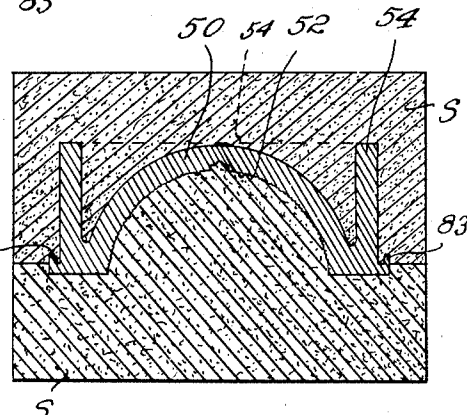


FIG. 7

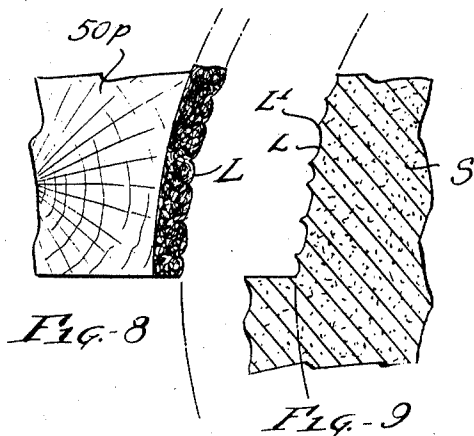


FIG. 8

FIG. 9

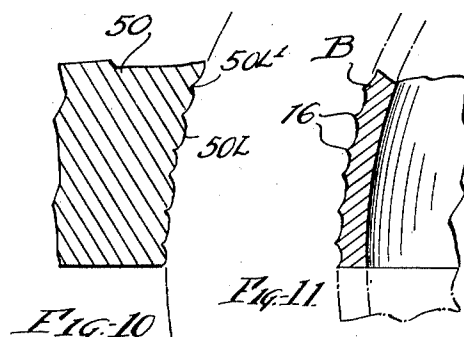


FIG. 10

FIG. 11

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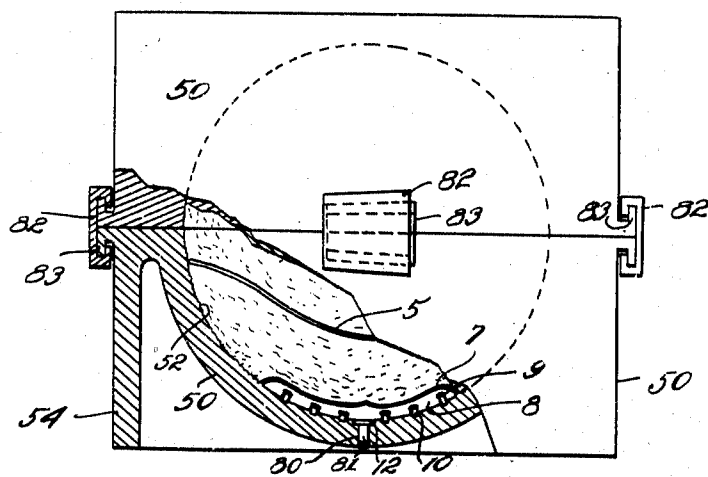
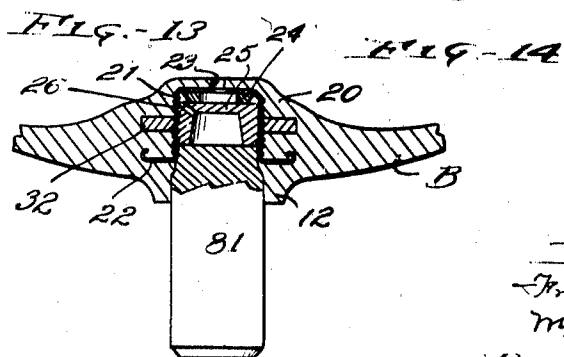
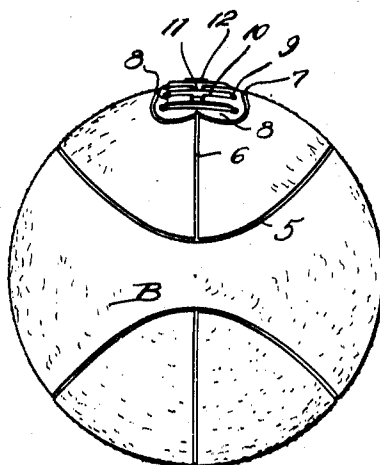


FIG. 12



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UNITED STATES PATENT OFFICE.

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METHOD OF MAKING INFLATED BALLS.

Application filed April 16, 1923. Serial No. 632,227.

The purpose of this invention is to make a durable and satisfactory football, soccer ball, or similar ball of rubber, and which shall have the appearance of the usual leather casing of such articles and which may be cheaply and economically manufactured by a simple and efficient process. Hollow rubber articles containing internal pressure can be made in almost any conceivable shape by various processes, but to supply the demand for rubber footballs, it is necessary that they shall have the appearance, weight, balance, resiliency and a surface as nearly similar to the usual footballs as practicable. It is desirable in making the rubber surface to have the appearance of leather, that shall be slightly rougher than as though it were a true imitation of leather, in order that it may be firmly gripped and slipping of the fingers when catching, throwing or passing the ball, may be avoided.

In the making of molds in which the article is finished a treatment of the surface of the mold to produce the appearance of a leather casing, would be very difficult or at least very expensive by the use of any previously known methods of making such molds. Another object of our invention therefore, is the accomplishment of a simple expedient in making the molds, whereby we may secure the above results, in making permanent molds in which the rubber may be formed.

Another specific object is the provision of simple means of inflation with the proper desired pressure. In the accompanying drawings, we have shown a method for making the molds, and showing the resulting article, the following description having reference to the drawings is intended to make clear the method of carrying out our invention.

An advantage of our process and the unique desirable results obtained are set out in the following description.

In the drawings, Fig. 1 is a section through a pair of the forming molds in a press showing the manner of seating sheets of rubber stock in the cavities, the stock being here illustrated as seated and about to be united and severed along the meeting edges of the molds; Figs. 2, 3 and 4 are sectional details showing the mold and rubber lining adjacent the valve and illustrating the steps of

securing the valve and vulcanizing it in the article; Fig. 5 is a plan view of one of the molds; Fig. 6 is a transverse central section through the pattern placed in the sand for casting the mold; Fig. 7 shows the mold being cast in the sand; Fig. 8 is a diagrammatic view in the nature of an enlarged sectional detail illustrating the relative position of the leather on the pattern; Fig. 9 is a similar view illustrating the sand after removal of the pattern; Fig. 10 is a similar view illustrating the surface formed on the mold cast in such sand; Fig. 11 is a similar view showing the contour of the surface of the rubber formed in the mold; Fig. 12 is a view of a suitable vulcanizing mold partly in section; Fig. 13 is an enlarged sectional detail showing valve mechanism and a temporary plug for use in positioning the biscuit in the vulcanizing mold. Fig. 14 is a view of the completed football inflated.

Fig. 14 illustrates one form of football made in accordance with the present invention, comprising a single thickness of tough, yet resilient, rubber, the wall being divided into gores by grooves formed in the outer surface, giving the appearance similar to the usual football, these grooves being designated 5 and 6, while at the juncture of two of the apparent gores, the ball is given the appearance of the lacing opening by grooves 7 looped to define the space 8 usually occupied by leather inserts, there being depressions 9 to indicate the usual openings through which the lacing extends. The lacing is represented by ribs of rubber 10 connecting these openings as shown. A somewhat larger groove 11 represents the space between the two apparent inserts 8, while integral with the wall of rubber is a tubular portion 12 forming a valve opening.

For convenience in illustration, the surface in Fig. 14 is simply indicated as roughened or irregular, while the enlarged view of Fig. 11 is intended to show more clearly the actual appearance of the surface upon the wall portion B of the ball. This surface in general appears to be a finish of leather but the fine grooves and hair depressions of the natural leather are represented by projections 16, because as stated, the surface is as a matter of fact, a reversal of the surface formed in the pattern, as will be later described. It is to be understood,

however, that, if desired, an actual true reproduction of leather may be made, as is set out hereinafter in connection with the steps of the present process.

5 We form the article from sheet rubber by pneumatically seating it in mold cavities which are then brought together to join the portions in an edge seam and to cut off the surplus stock. Broadly, the process employed is that shown, described and claimed
10 in Reissue Patents Nos. 14,603 and 14,604 both granted Mar. 4, 1919, to F. T. Roberts. The forming mold members and the adjacent portion of a press for operating them
15 are illustrated in Fig. 1, the details of one feature thereof being shown in Figs. 2, 3 and 4, all of which will now be described.

The forming molds may be cast in any suitable fashion and as shown, consist of
20 body members 40 having mold cavities 41 each corresponding substantially to the shape of one half of the article, or preferably having an inward hump 42 as set out in Reissue Patent No. 14,604. These molds
25 have chambers 43 in their bases which communicate by passageways 44 with the mold cavities. Suitable suction pipes 45 communicating with the chambers enable the air to be exhausted from the cavities to pneumati-
30 cally seat therein sheet rubber stock A. The molds may be secured against platens 60 and 61 of a suitable press. Around the outside of the mold cavities 41 we have shown grooves 46 from which small passages 47
35 lead to the vacuum chambers of the molds, so that sheets of rubber stock A laid across the molds upon an application of the vacuum are securely held around the outside of the cavities, while vacuum beneath the sheets
40 may draw them into the molds, as shown.

Around the mold cavities are provided the raised cutting edges 48 serving to unite the edges of the stock within the cavities, and sever it from the surrounding sheet after the
45 manner of the process described in the prior patents mentioned.

As a suitable means for forming a valve, we have chosen a construction illustrated in Fig. 13 where on the inside of the wall B,
50 opposite the tubular projection 12 is an inwardly projecting body of rubber 20 in which is imbedded a thin threaded ferrule 21, preferably having a flange as indicated at 22, imbedded in the rubber and having an
55 inner end wall provided with an opening 23 registering with an opening in the rubber 20. Within the ferrule is a rubber gasket 24 against which may be seated a hollow plug 25 having an opening 26 closed from the interior of the football by the gasket 24
60 when in the position shown in Fig. 13. As the plug 25 is screwed outwardly slightly, it will be seen that air may pass through the opening 26 through the gasket 24 and opening 23. A threaded washer 32 embracing a

ferrule 21 facilitates the placement of this ferrule and assures it being firmly secured in the rubber 20.

To position and secure the valve mechanism described, we may cause the sheet stock
70 of one mold when seated to be pressed over an upwardly projecting threaded pin 70, having a suitable screw head 71 with which it may be removed, and having its upper end beveled at 72 to cause it to pierce the rubber
75 more easily. Around the pin is a cavity 15 forming the tubular projection 12 around the valve opening of the article. When the stock is first seated, it takes the position shown in Fig. 2 and we then press the fer-
80 rule 21 over the pin forcing the rubber into the cavity 15. A pellet of rubber 20^a is placed around this ferrule and over the flange and pressed into contact with the pre-
85 viously seated stock as shown in Fig. 3, and the washer 32 may be then threaded on the ferrule, and another pellet of rubber 20^b placed over this washer and all of these
90 pressed downwardly into the position shown in Fig. 4. When the article is removed from the mold, it will be seen that these parts will slide easily off from the pin 70 and when in the vulcanizing mold, they will homogene-
95 ously unite embedding the valve parts firmly as described. A small hole 23 may be cut through the upper portion of the last pellet of rubber 20^b.

The vulcanizing mold illustrated in Fig. 12 is formed in a peculiar manner as here-
100 inafter explained in detail for the purpose of giving the ball the leatherlike appearance desired. The mold members are held together by any suitable means as for example the grooved wedge members 82 which en-
105 gage tapered ribs 83 on molds. As shown in this view, this vulcanizing mold comprises two members 50 each having a hemispherical cavity and one of the members has at the bottom of the cavity a small opening
110 30 in which is placed a plug 81 which screws into the valve ferrule as shown in Fig. 13. This properly positions the article and causes the ribs and grooves in the mold which form the ribs, the pad and the lacing
115 heretofore described, to come in the proper place.

Convenient means for inflating through such a valve as described is to use a tapered
120 nipple connected with an air hose and adapted to wedge tightly into the inner surface of the plug 25, whereby the plug may be turned. After inflation to the proper pres-
125 sure, rotation of the nipple and plug sets the plug against the gasket 24 and seals the opening.

As shown in Fig. 12, the general shape of the vulcanizing mold is that of a rectangular cast metal body 50 having a cavity 52
130 corresponding to one half of the football as molded, while opposite the cavity the metal

is shaped to provide flanges 54 and cored out to save metal and cause an even application of vulcanizing heat.

To make such a body of cast metal, we first make a pattern of wood or other convenient material forming on the pattern the projections and ribs corresponding to the configurations of the representation of lacing and joining of the gores. This pattern is designated 50^p, Fig. 6, and is shown as surrounded by the molding sand S which is of course carried in suitable mold boxes. This pattern is of course shaped to provide for the flanges 54 and the other characteristics to be given the casting comprising the mold. It is shown as lined with a layer of natural leather L, with its finished or outer surface presented to the sand at the male portion of the sand mold. This leather is selected to produce the characteristics of a football, for example, a good grade of pigskin, such as is frequently used on high grade footballs. The pattern is then removed from the sand and the metal forming the rubber-working mold 50 poured into it as shown in Fig. 7, and this casting forming the mold member is then suitably finished and machined, where necessary.

Referring to Figs. 8 and 11, we may consider Fig. 8 as a section through a portion of the vulcanizing mold pattern, in which the wood or other material forming the body of the pattern is designated 50^p, while L indicates the surface of the leather and it will be noted that the larger convexities face outwardly. Now when the sand S is formed complementary thereto, the larger convexities project inwardly as shown and the small pointed depressions form outwardly projecting points on the sand as at L'. The metal mold surface 50 cast against this sand surface is illustrated in Fig. 10 where it will be noted that the surface of Fig. 8 is reproduced, the projections and depressions being indicated at 50^p and 50^L. After the rubber article is formed in the forming mold, the proper shape and size, it is transferred to the vulcanizing mold 50, and here vulcanized with sufficient internal pressure to cause the rubber to conform to the surface 50^p and to form the grooves defining the gores and lacing opening representations. The representation of the leather surface reversed, is indicated diagrammatically in Fig. 11 on the article itself, where we have the depressions and projections reproduced. The pointed projections are indicated at 16 at either side of the curving depressions. Projections, see Fig. 5, 5^a, 6^a and 7^a and depressions 10^a and 12^a in the mold correspond to the depressions 5, 6, etc., and raised portions on the ball.

It will be seen that the reproductions of such a finish on a surface is made up of depressions and projections having a certain relationship to the concavo-convex surface

of the mold and article and that through the successive steps the relationship of these projections remains the same, but the effect is reversed through the successive steps. That is to say, the leather effect is natural on the concave surface of the pattern and resulting mold, while it is reversed on the convex surface of the sand and the finished article.

From the foregoing description, it will be seen that we have provided a simple and effective method for the manufacture of a football of rubber. The selection of the material for rubber is such that it is resilient and yet tough, capable of standing abuse when in use, while the finished article has the very close resemblance to a leather football, provided with the usual rubber bladder. Coloring the rubber substantially that of tan pigskin gives an accurate and pleasing imitation of a football.

While the imitation leather effect on the surface of the rubber as shown is more desirable in the sense that it provides a slightly rougher surface on the exterior avoiding likelihood of the hands slipping, we may make the exact imitation of leather, forming the preliminary pattern, of a material, say such as plaster of Paris, the leather imitation being placed in the inner surface by leather over the outside of a male member, corresponding to one half of the article. The projections and depressions of the leather will then have the same relationship to the general curve of the convex surface of the finished article, as on a leather football itself, with the result that through the successive steps described, the consequent reversal of the projections and depressions will be just the opposite as that described in Figs. 8 and 11, and a perfectly true imitation of the leather will be caused to be effected on the surface of the finished article. It is to be understood that both of these methods are intended to be included within the present invention.

Notice is given that the football herein illustrated and described is claimed in our divisional application No. 738,827 filed September 20, 1924.

Having thus described my invention, I claim:

1. The process of making a valved article of rubber, consisting of forming the article of joined parts, by seating raw rubber sheet stock in cavities, perforating one of the sheets for a valve opening, positioning the valve parts and surrounding them with rubber built up on the interior of the sheet, thereafter closing the article and uniting the sheets to complete the article, and finishing it in a vulcanizing mold with internal pressure.

2. The method of making footballs and similar articles, comprising pneumatically

seating rubber sheet stock in mold cavities, one of which is provided with a peg to perforate the stock in a certain region, and thereafter positioning a valve ferrule by means of such peg on the interior of the seated stock, then bringing the two portions of seating stock into conjunction to form the biscuit, then transferring the biscuit to the vulcanizing mold, then vulcanizing it with the valve ferrule in place.

3. The method of making footballs and similar articles consisting of drawing sheet rubber stock in mold cavities by suction, one of the mold members being provided with a pointed peg projecting toward the interior of the cavity, mounting a valve ferrule on the projecting portion of said peg on the interior of the seated stock, thereafter causing the seated stock to be joined and finally vulcanizing the article with the valve ferrule in place.

4. The method of making hollow rubber articles having valves, comprising placing sheet stock across the mouths of mold cavities, exhausting the air from such cavities to seat said stock by suction, one of the mold members being provided with a peg projecting into its cavity, whereby the said stock may be perforated about the peg, then placing a valve ferrule on the internally projecting portion of the peg, then applying a rubber reinforce about the valve ferrule, then joining the two parts of the article, then transferring the formed biscuits to a vulcanizing mold and vulcanizing it.

5. The method of making footballs and similar articles, comprising placing raw

rubber stock across the mouths or mold cavities, one of the mold members having an inwardly projecting peg, applying suction to the cavities to cause the rubber to seat therein, forcing the rubber down around the projecting peg, applying a flanged valve ferrule to the inwardly projecting portion of the peg, applying rubber about the valve ferrule and over its flange, screwing a nut on the ferrule, applying rubber over the nut, whereby the ferrule and nut are embedded in rubber, then joining parts of the article to form a complete closure with heat expanding material within it, and finally transferring the article to a vulcanizing mold and vulcanizing it by heat with internal pressure.

6. The method of making valved rubber articles, comprising seating parts of the article pneumatically in mold cavities, one of the mold members being provided with an inwardly projecting peg, mounting a valve ferrule on such peg, reinforcing the ferrule on the inner side of the article, bringing the article parts together to join them, removing the formed biscuit from the mold, positioning a peg from the exterior in the valve ferrule, and placing the biscuit in a vulcanizing mold which has a recess to receive the peg, and surface indentations and projections to mold the exterior surface of the article in representation of a laced leather football.

In testimony whereof, we hereunto affix our signatures.

FRED THOMAS ROBERTS.

VILLIAM EUGENE ROBERTS.