Jan. 16, 1945. M. B. REACH 2,367,374

METHOD OF MAKING INFLATABLE ATHLETIC GAME BALLS

Filed March 9, 1943 2 Sheets-Sheet 1

Fig. 1.

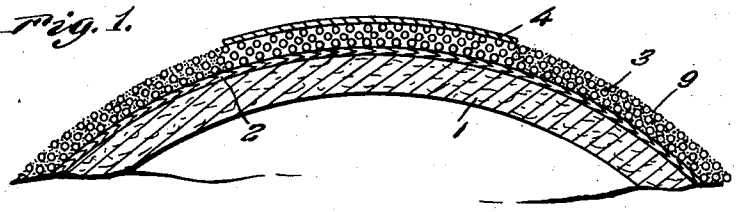


Fig. 2.

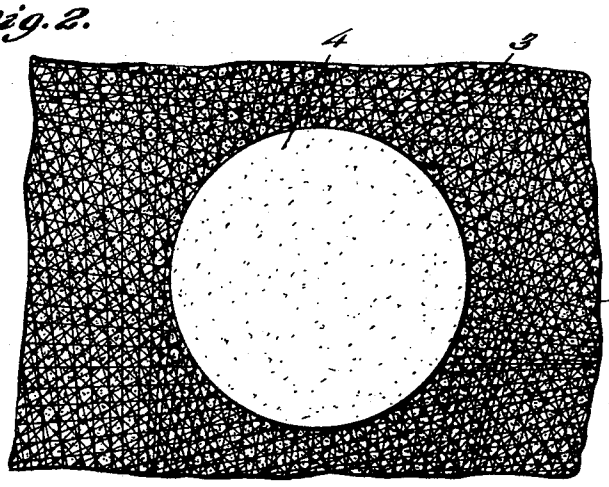


Fig. 3.

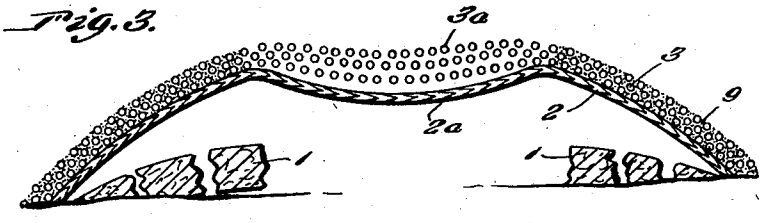
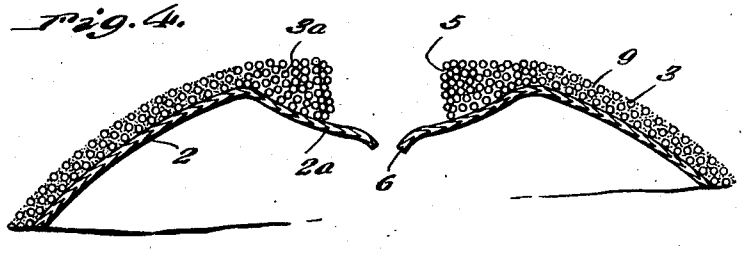


Fig. 4.



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Fig. 4a.

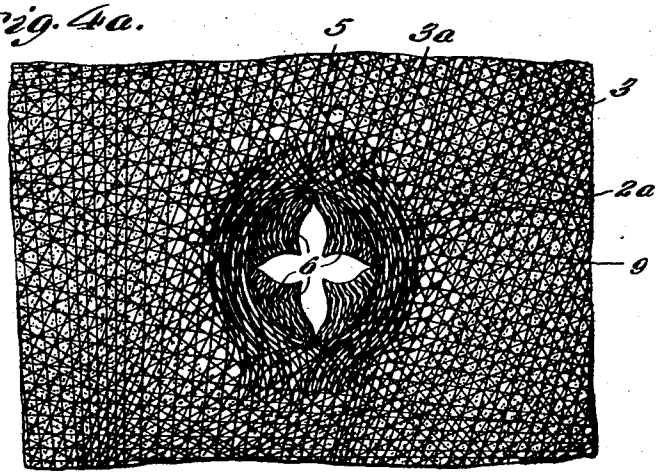


Fig. 5.

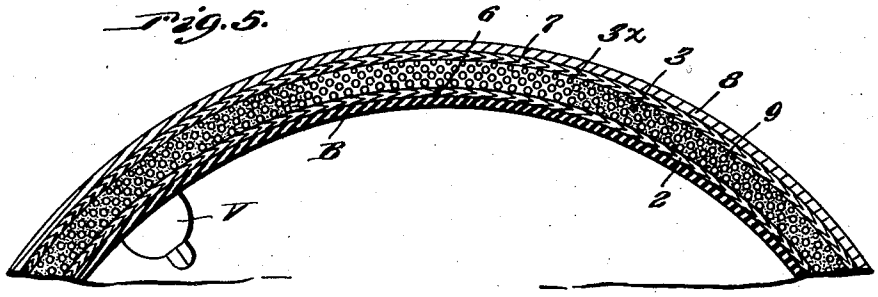


Fig. 6.

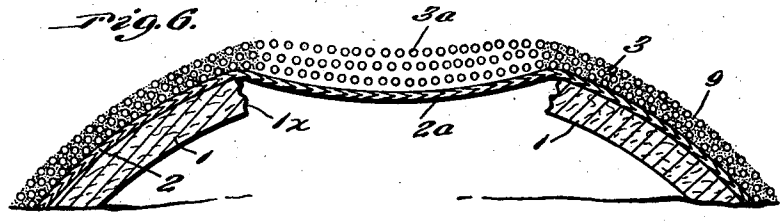
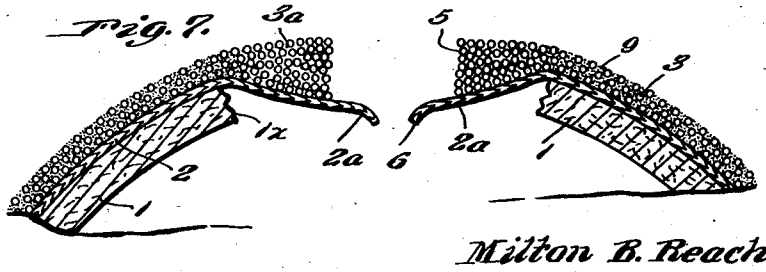


Fig. 7.



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METHOD OF MAKING INFLATABLE ATHLETIC GAME BALLS

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Application March 9, 1943, Serial No. 478,568

13 Claims. (Cl. 154—16)

The invention relates to a method of making a spherical inflatable athletic game ball.

More particularly the invention relates to a method of making a spherical inflatable athletic game ball of the type which embodies as a ball carcass or body element, windings of elongated material wound substantially in great circles over a substantially rigid spherical form of reducible material.

An object of the invention is to provide a novel method of providing a small opening in the spherical great circle wound carcass or body for removal of the reduced material of the rigid form, and of restoring the wound carcass or body at the area of the opening, substantially to its original relationship as to the great circle windings of elongated material, and to provide a spherical inflatable ball having a great circle wound carcass with its windings in said form removal area restored substantially to their original relationship as wound in great circles, crossing each other.

Other objects will appear hereinafter.

The invention consists in method steps as hereinafter described and particularly pointed out in the claims.

In the drawings

Fig. 1 is a diagrammatic sectional view of a portion of the great circle wound spherical ball carcass or body built on the rigid spherical shell of reducible material, and with the small covering member or shield of sheet material applied to the wound carcass.

Fig. 2 is a fragmentary face view of the carcass of Fig. 1 with the small covering member in place.

Fig. 3 is a view similar to Fig. 1 of the carcass with the small shield or covering member removed and the rigid form reduced by being broken up, and with the portions of the uncemented cord windings and of the underlying layer in the shielded area in a slack condition.

Fig. 4 is a similar view showing the uncemented slack cords separated, the foundation layer cut to provide an opening and the reduced material of the form removed. Fig. 4*a* is a face view of Fig. 4.

Fig. 5 shows the inflating bladder in place and the opening in the foundation layer closed and the slack cords restored substantially to their original relationship, and the covering material applied to complete the ball.

Figs. 6 and 7 are views similar to Figs. 3 and 4 showing a modified procedure.

In the method of my invention, the substantially rigid hollow form 1 or shell of wax or other reducible material made in the spherical shape of the ball, such as for basketball, volley ball, soccer or the like, is covered with a layer of material 2 providing a non-slipping or friction surface for receiving windings substantially in great circles of elongated material of fibrous or other nature, such as cord or the like, of cotton or other material.

The layer of material 2 applied to the spherical wax form may be of tubular knit fabric or stockinette or it may be a layer of rubber cement or a layer of other material providing a non-slipping or friction surface for the great circle windings of cord or other elongated material.

Prior to application of the said layer 2, the rigid spherical form 1 may be coated with starch or like material to prevent sticking of the form to the binding or adhesive material which is used, such as rubber cement.

If stockinette is used as the material of said layer, it is stretched on the form and then adhesive material such as rubber cement is applied as by dipping the stockinette covered form into the adhesive solution. The adhesive or cement applied to the form will serve, when dry, to close off the interstices between the crossing and re-crossing great circle windings of the subsequently applied cord or elongated material 3, and will prevent any penetration by wax form particles or by the inflating bladder.

The elongated material 3, such as cord, is then wound over the form substantially in great circles with the desired tightness due to the rigidity of the spherical form and in the desired volume of said crossing great circle windings of elongated material to form a body or carcass member of the required weight and strength. The winding can be carried on with the desired tightness owing to the rigidity of the form, thus eliminating the possibility of misshaping the carcass at any point which might occur if the winding took place upon a yielding backing.

After the elongated material is wound substantially in great circles over the substantially rigid spherical form in the desired volume or thickness, the next step, according to my invention is to apply adhesive material or cement to the wound carcass member. The adhesive is applied for bonding the crossing great circle windings of elongated material together in an adhesive relationship throughout the greater part of the area of the wound carcass or body member while leaving a relatively small area thereof substantially dry and free from the ad-

hesive or cement, at the point at which it is desired to provide an opening for removal of the reduced material of the form. The point for outlet of the wax may be any chosen point on the surface of the great circle wound carcass, and the small uncemented portion must be of an area too small to permit passage of the spherical form therethrough.

This small uncemented area may be provided in any suitable way and by any suitable means. It may be done by marking the relatively small area on the surface of the wound carcass on the form as by means of a chalk or crayon circle or other outline, and then applying the adhesive to the greater part of the area of the wound carcass while leaving dry and uncemented the small area so marked. The wound form may be submerged in liquid adhesive or cement until the liquid adhesive just contacts the chalk line circle of the small area to be left dry and uncemented. This requires considerable care in handling. Another and desirable method according to the invention, is to adhesively apply a small covering shield 4 of sheet material such as paper, to the wound carcass at the point selected for providing an opening, to mark the relatively small area to be left uncemented by shielding or covering the same. The remaining and greater area of the wound carcass or body is then dipped or coated with the chosen binder or adhesive element, of which rubber cement is an example, while the relatively small area marked by the small adhesive covering shield or mask of paper or other sheet material is left uncemented, as indicated in Fig. 1.

The wound carcass on the form with the covering shield 4 of sheet material adhesively applied thereto, may be completely immersed in the chosen liquid binder or adhesive material, such as rubber cement. In this complete immersion the shield 4 of sheet material, such as of paper or the like, covering the area keeps it free from cement except for that small quantity which might seep in under the edge of the shield or mask of paper. This may readily be allowed for by providing a tolerance in the measurement of the paper mask, by making the mask sufficiently larger than the size of the area of the wound carcass to be left uncemented.

After application of the binder or adhesive to the wound carcass except for the small marked area, the adhesive 9 is allowed to dry or set, binding together the great circle windings of cord or other elongated material. The small uncemented area of the great circle wound carcass may, for example, be approximately two or three inches in diameter or across.

In the use of a patch or shield of adhesive paper or the like covering the small area, this small adhesive covering is then removed.

The material of the rigid spherical form is then reduced as by breaking it up into relatively small pieces by striking on the surface of the cemented great circle wound carcass with a suitable implement. The material of the form may be otherwise reduced, as by melting. The great circle wound carcass is then supported or sustained only by the cement, while the small uncemented area of the wound carcass is in a collapsed, slack condition.

The slack uncemented great circle winding portions 3a of the carcass in the small uncemented area are then spread apart or separated manually, as by the use of a pointed tool, to provide a small opening 5 in the carcass which may, for example, be about one and one-half or two inches across or in diameter, and too small to permit passage of the spherical form.

In the use of a layer of material 2 underlying the great circle windings, that portion 2a of the layer beneath the uncemented area of the great circle windings of the carcass, is then cut in registration with the opening provided by the separated or spread apart uncemented winding portions of the carcass. In the use of stockinette as the layer of material underlying the cord, this stockinette area 2a may be cut in a substantially circular or other shape to provide a flap or a patch member which may be partially or wholly cut out such as is disclosed in my prior Patent 2,255,749 of Sept. 16, 1941, to provide the opening in the stockinette, or it may simply be cut in the form of a slit or a cross cut in the stockinette which may be spread to provide the opening therein. The cut is indicated at 6 in the drawings. The cut may be made with any suitable sharp pointed cutting instrument and may be made with a pair of sharp pointed scissors.

The reduced material of the form is then removed through the relatively small registering openings provided by the cut in the foundation layer of material and by the spread apart uncemented windings.

Alternatively, instead of completely breaking up the rigid spherical form into relatively small pieces, I may initially break an opening 1x, Figs. 6 and 7 in the rigid spherical form 1, substantially only in the region of the small uncemented area of the great circle wound carcass. This may be done by means of a pointed hammer or like instrument. The unbroken main portion of the rigid spherical form will then support the great circle wound carcass, while the small uncemented area of the wound carcass will be in a slack and collapsed condition overlying the opening 1x broken in the rigid spherical form.

The procedure hereinbefore described as to spreading the windings and cutting the underlying layer of material is then carried out to provide the opening in the carcass, following which the intact portion of the form 1 is broken up into relatively small pieces and the reduced material of the form removed through the opening.

After the reduced material of the form is removed, means rendering the ball inflatable, such as a bladder B may be inserted with the provision of suitable valve means V extending through the carcass wall at any desired point.

The great circle wound carcass is then preferably partially inflated and the opening cut in the foundation layer of material is closed, including restoring any cut out portion. The carcass having thus been inflated to slightly under size, the uncemented area is still slightly slack or loose and desirably with a pointed stick or tool or otherwise, the displaced uncemented winding portions 3a of cord or other elongated material are raked back into their approximate original relationship. The inflation is then continued and completed and the replaced cords or windings will assume their proper places substantially as originally wound in great circles crossing each other.

The replaced or restored uncemented crossing great circle winding area is then coated with the desired adhesive and allowed to dry or set. The adhesive may be applied by dipping or brushing.

After drying of the cement, a final winding

layer, such as of finer cord 3x, may be applied over the inflated ball-carcass or body member.

Stockinette or other textile or fibrous material 7, for providing a smooth sub-surface layer in respect to the outer cover of the ball, is preferably applied over the inflated spherical carcass or body, and over the final winding of finer cord if the final layer of cord is used.

Then a final dip or brushing of the ball with a proper adhesive or cement, is performed. The ball is then desirably subjected to a moulding operation under pressure and heat. The outer cover of leather or other material 8 desirably in the form of panels is then applied and joined to the ball by the adhesive, preferably followed by a final moulding operation to set the leather in the cement and preferably to provide moulded ribs in the spaces or seams between the adjacent edges of the leather panels, as disclosed in my prior patents, 2,182,052 Dec. 5, 1939, and 2,255,749 Sept. 16, 1941.

I claim:

1. A method of making a spherical inflatable athletic game ball which comprises, applying over a substantially rigid spherical form of reducible material, windings of material in elongated form substantially in great circles crossing each other to form a carcass member, applying to said wound carcass member adhesive cement to bond the substantially great circle windings of elongated material together at their crossings in an adhesive relationship throughout the greater part of the area of the wound carcass member while leaving a relatively small area thereof substantially free from adhesive cement, said uncemented area being too small to permit passage of the spherical form therethrough, allowing the adhesively treated wound carcass member to set, reducing the rigid form, said small uncemented area of the wound carcass then being in a collapsed slack condition, displacing the slack uncemented portions of the windings of the carcass in the small uncemented area to provide an opening therein, removing the material of the form in a reduced state through said small opening, inflating the ball, closing said opening by restoring the displaced uncemented winding portions substantially into their original relationship crossing each other substantially in great circles, applying adhesive cement to the restored uncemented area, and applying material covering the ball.

2. A method of making a spherical inflatable athletic game ball which comprises, applying over a substantially rigid spherical form of reducible material, windings of material in elongated form substantially in great circles crossing each other to form a carcass member, applying at a suitable point on said wound carcass a relatively small shield of an area less than the area of the surface of the ball, applying to said wound carcass member adhesive cement to bond the windings of elongated material together at their crossings in an adhesive relationship throughout the greater part of the area of the wound carcass member while leaving an area thereof covered by the shield substantially free from the adhesive cement, said small uncemented area being too small to permit passage of the spherical form therethrough, allowing the adhesively treated wound carcass member to set, removing the shield, reducing the rigid form, said small uncemented area of the wound carcass then being in a collapsed slack condition, displacing the slack uncemented portions of the windings of the carcass in the small uncemented area to provide an opening therein, removing the material of the form in a reduced state through the small opening, inflating the ball, closing said opening by restoring the displaced uncemented winding portions substantially into their original relationship crossing each other substantially in great circles, applying adhesive cement to the restored uncemented area, and applying material covering the ball.

3. A method of making a spherical inflatable athletic game ball which comprises, applying over a substantially rigid spherical form of reducible material, a layer of material having a substantially non-slipping surface, applying windings of material in elongated form substantially in great circles crossing each other over said layer of material on said rigid form to form a carcass member, applying to said wound carcass member adhesive cement to bond the substantially great circle windings of elongated material together at their crossings and to said underlying layer of material in an adhesive relationship throughout the greater part of the area of the wound carcass member while leaving a relatively small area thereof substantially free from the adhesive cement, said uncemented area being too small to permit passage of the spherical form therethrough, allowing the adhesively treated wound carcass member to set, reducing the rigid form, said small uncemented area of the wound carcass then being in a collapsed slack condition, displacing the slack uncemented portions of the windings in the small uncemented area to provide an opening therein, cutting the underlying layer of material to provide an opening therein, removing the material of the form in a reduced state through said opening in the underlying layer of material and through the small opening between the slack uncemented portions of the windings of elongated material, inflating the ball, closing the opening in the carcass including restoring the displaced uncemented winding portions substantially into their original relationship crossing each other substantially in great circles, applying adhesive cement to the restored uncemented area, and applying material covering the ball.

4. A method of making a spherical inflatable athletic game ball which comprises, applying over a substantially rigid spherical form of wax material, a layer of stockinette, applying adhesive cement to said layer of stockinette, applying windings of cord substantially in great circles crossing each other over said layer of stockinette on said rigid wax form to form a carcass member, applying adhesive to said cord wound carcass member to bond the windings together at their crossings and to said underlying stockinette in an adhesive relationship throughout the greater part of the area of the cord wound carcass member while leaving a relatively small area thereof substantially free from the cement, said uncemented area being too small to permit passage of the spherical form therethrough, allowing the adhesively treated cord wound carcass member to set, breaking the wax form into small pieces, said small uncemented area of the wound carcass then being in a collapsed slack condition, displacing the slack uncemented portions of the cord windings of the carcass in the small uncemented area to provide an opening therein, cutting the underlying layer of stockinette to provide an opening therein, removing the material of the form in a reduced state through the opening in the underlying layer of stockinette

and through the small opening between the slack uncemented portions of the cord windings, inflating the ball, closing the opening in the carcass including restoring the displaced uncemented cord winding portions substantially into their original relationship crossing each other substantially in great circles, applying adhesive cement to the restored uncemented area, and applying material covering the ball.

5. A method of making a spherical inflatable athletic game ball which comprises, applying over a substantially rigid spherical form of wax, windings of cord substantially in great circles crossing each other to form a carcass member, applying adhesive cement to said cord wound carcass member to bond the cord windings together at their crossings in an adhesive relationship throughout the greater part of the area of the cord wound carcass member while leaving a relatively small area thereof substantially free from the cement, said uncemented area being too small to permit passage of the spherical form therethrough, allowing the adhesively treated cord wound carcass member to set, breaking the wax form into small pieces, said small uncemented area of the wound carcass then being in a collapsed slack condition, displacing the slack uncemented portions of the cord windings of the carcass in the small uncemented area to provide an opening therein, removing the material of the form through the small opening between the slack uncemented portions of the cord windings, inflating the ball, closing the opening by restoring the displaced uncemented cord winding portions substantially to their original relationship crossing each other substantially in great circles, applying adhesive cement to the restored uncemented area, and applying material covering the ball.

6. A method of making a spherical inflatable athletic game ball which comprises, applying over a substantially rigid spherical form of reducible material, windings of material in elongated form substantially in great circles crossing each other to form a carcass member, applying to said wound carcass member adhesive cement to bond the windings of elongated material together at their crossings in an adhesive relationship throughout the greater part of the area of the wound carcass member while leaving a relatively small area thereof substantially free from the said adhesive cement, said uncemented area being too small to permit passage of the spherical form therethrough, allowing the adhesively treated wound carcass member to set, reducing the rigid form, said small uncemented area of the wound carcass then being in a collapsed slack condition, displacing the slack uncemented portions of the windings of the carcass in the small uncemented area to provide an opening therein, removing the material of the form in a reduced state through said small opening between the slack uncemented portions of the windings, inflating the ball to slightly under size leaving the uncemented area slightly slack with respect to the cemented greater area of the carcass, restoring the displaced uncemented winding portions by moving them into their approximate original relationship, further inflating the ball when the partially replaced windings will move substantially into their proper relationship crossing each other substantially in great circles, applying adhesive cement to the restored uncemented area, and applying material covering the ball.

7. A method according to claim 1 in which said adhesive cement is applied and said relatively small area is left uncemented by dipping the wound carcass in the adhesive cement until the surface of the liquid cement engages substantially only to the edge of the small area to be left uncemented.

8. A method according to claim 2 in which said adhesive cement is applied and said relatively small shielded area is left uncemented by dipping the wound carcass in the adhesive cement.

9. A method according to claim 1 in which the rigid form is reduced substantially only in the region of said small uncemented carcass area which then is in a collapsed slack condition, the remaining main portion of the rigid spherical form being unreduced and providing a rigid support for the cemented portion of the carcass and for the edges of the small uncemented carcass area, during the formation of said opening therein, thereafter reducing the said remaining portion of the rigid spherical form and removing the reduced material of the form.

10. A method according to claim 3 in which the rigid form is reduced substantially only in the region of said small uncemented carcass area by striking on the exterior of said small uncemented carcass area, the remaining portion of the rigid spherical form being unreduced and providing a rigid support for the cemented portion of the carcass and for the edges of the small uncemented carcass area during displacement of the slack uncemented windings and cutting the underlying layer of material, thereafter reducing the remaining portion of the rigid spherical form, and removing the reduced material.

11. A method according to claim 1 including applying a winding of cord over the inflated carcass, and adhesively applying the covering material.

12. A method according to claim 1 in which stockinette is applied before the covering material providing a smooth subsurface layer for the covering material.

13. A method according to claim 5 including coating the rigid form of wax with a material to prevent sticking of the adhesive cement to said form.

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