Sept. 8, 1936. D. F. TWISS ET AL 2,053,450

PRODUCTION OF PLAY BALLS

Filed Nov. 8, 1934

Fig. 1.

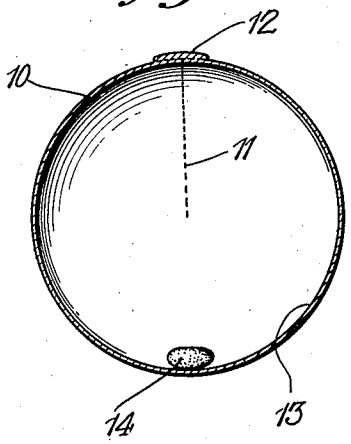


Fig. 2.

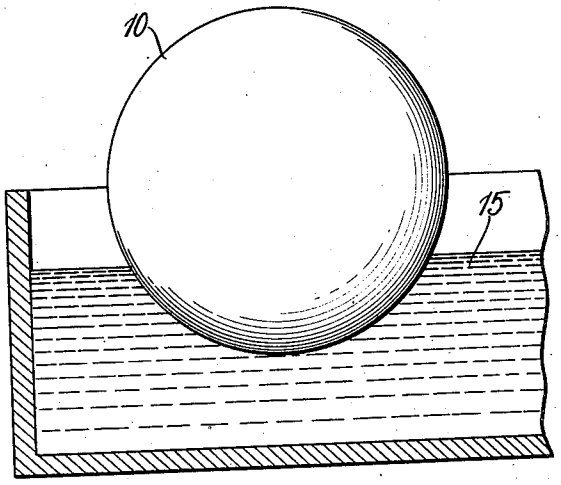


Fig. 3.

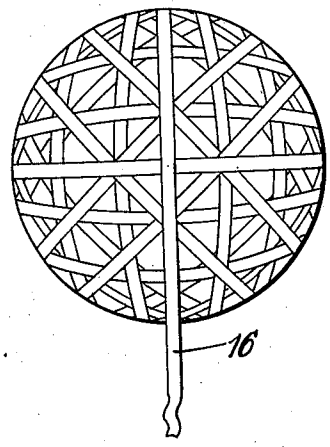
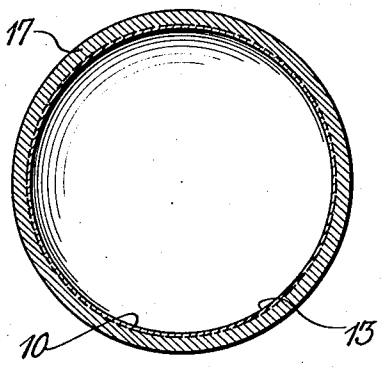


Fig. 4.



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Patented Sept. 8, 1936 2,053,450

UNITED STATES PATENT OFFICE

2,053,450

PRODUCTION OF PLAY BALLS

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Application November 8, 1934, Serial No. 752,112
In Great Britain November 16, 1933

3 Claims. (Cl. 154—16)

This invention concerns improvements in or relating to the production of play balls, as for example tennis balls.

The object of the present invention is to produce play balls, for example, tennis balls free from seams and other irregularities.

Heretofore, the inner cores or gas containers of play balls, such as tennis balls, have usually been produced from shaped strips of compounded rubber mixings. The handling of such strips is, however, difficult and defective joints with consequent leakage therefrom are a common occurrence.

In some cases, the spherical container has been formed from two hemispherical cups of compounded rubber mixings, but this does not remove the risk of faulty joints.

Tennis balls and similarly inflated balls also suffer from leakage, which may be due to one or more of the three following causes:—

1. The highly compounded nature of the rubber compound of which the spherical gas container is formed.

2. Imperfect joints, accentuated in a large measure by the extreme flexing of the component parts.

3. Ineffective sealing of the aperture through which gas is inserted when means such as hypodermic needle is employed for the purpose.

According to the present invention, the method for the production of play balls, for example, tennis balls comprises forming a relatively thin open hollow substantially spherical nucleus of elastic material from a liquid composition thereof by deposition on a preferably spherical former, separating the substantially spherical elastic deposit from the former, closing the aperture in the elastic deposit and thereafter coating the thin elastic nucleus with rubber to the desired thickness.

The elastic material which forms the spherical nucleus is preferably made of rubber.

The aperture in the thin elastic nucleus produced can be closed, for example, either by tying or by applying a cap preferably one representing part of a sphere of the same radius as the nucleus. The cap can be attached by means of rubber solution or latex. If the spherical former is supported on, for instance, a thin wire, then the spherical nucleus can be removed by making a slit in the elastic material, preferably on either side of the aperture formed by the supporting wire and after removing the nucleus, sealing the slit with, for instance, rubber latex. Alternatively, if desired, the substantially spherical former, hung for instance on a wire, can be made of material which can at will be rendered plastic or fluid.

The thin elastic spherical nucleus produced is then coated with rubber in any one or more of several ways, the spherical nucleus serving to provide the desired configuration. The covering, for example, can be effected by a dipping operation using a concentrated compounded rubber latex. The cupping of each half of the spherical nucleus may be effected in several operations and the building-up of the necessary thickness may be facilitated and expedited by applying a coagulant to the surface between two immersions in the latex. Other known methods of accelerating the formation of a layer of the necessary thickness can also be employed.

Alternatively, the spherical nucleus of thin elastic material can be covered with compounded rubber by winding with unvulcanized, but vulcanizable, rubber tape which may be produced in any convenient way, for example, by calendering compounded rubber or by spreading compounded rubber solutions or latex. The winding is continued until an external layer of the desired thickness has been applied and the weight and dimensions of the ball are of the required magnitude.

Whichever procedure is adopted for coating the elastic nucleus with rubber, the article produced is subsequently vulcanized in a spherical mould. In this way, a ball with a seamless wall is produced.

Inflating agents may be introduced into the spherical nucleus of thin elastic material before this is closed, or inflating agents may be introduced at any stage subsequently by means of a hollow needle in well known manner. If a hollow needle is employed, it is desirable to apply a suitable plug of soft rubber to the inside of the spherical nucleus before this is closed. It may also be desirable to introduce agents for increasing the impermeability of the wall of the rubber ball to be produced prior to the closing of the spherical nucleus; the construction of the spherical nucleus and its possible transparency are features facilitating the most effective application of any lining material which may be spread uniformly either before or after the sealing of the nucleus.

Where aqueous emulsions or dispersions of rubber are employed for producing the spherical nucleus and/or for the subsequent coating of the substantially spherical nucleus of elastic material, the emulsions or dispersions can comprise

those consisting of or containing rubber, guttapercha, balata, or similar vegetable resins occurring naturally or artificially obtained.

Such artificial aqueous dispersions may include those of coagulated rubber, vulcanized rubber, synthetic rubber, waste or reclaim. If desired, any of the aforementioned dispersions may be used alone or in admixture with one another.

Any of the aforesaid dispersions may contain the usual known compounding ingredients and/or may be in concentrated form.

Concentrates, such as are obtained in British Patents 290,313 and 219,635, to which may be added any one or more of the usual compounding ingredients, may also be used.

The following are examples of the method for the manufacture of play balls according to the present invention.

EXAMPLE 1

Calendered tape tennis balls

A rubber bladder (of approximate composition rubber 92, sulphur 2, zinc oxide 1, mineral oil 4, accelerator 1) is made by dipping a spherical former not exceeding 2" diameter into a suitably compounded latex dispersion, or rubber solution, and then vulcanizing the dried thin rubber deposit, after which the neck portion is cut off. Blowing agents are then introduced before the rubber cap of similar curvature to the rubber deposit conveniently perforated with a fine hole is cemented on with a rubber or latex cement, which vulcanizes at ordinary temperatures without the application of any heat, as it is essential to prevent premature action of the blowing agents. Shortly before the winding or building up operation, the small pin hole in the rubber cap is sealed with a drop of latex or rubber cement. By applying a small amount of latex dispersion to the base of the balloon its balance is made substantially perfect. The spherical bladder acts as a former on which the ball cover is built up and becomes an integral part of the vulcanized ball. The exact manner in which the spherical rubber bladder is made is of secondary importance, so long as it is of suitable size and strength.

A thin spherical rubber former is taken, made from a compounded latex dispersion; the complete thin sphere formed has a gross weight, 3.33 grams of which the blowing agents constitute 0.9 gram. The thin rubber former is then wound with calendered tape approximately 10 mms. wide and 0.5 mm. thick, made from ordinary compounded milled rubber of approximate composition rubber 50, sulphur 3, clay 30, amorphous carbon 9, zinc oxide 6, accelerator 2. The moderately adhesive tape is wound by hand under slight tension, substantially after the manner of winding a golf ball, the tape being made to cover all parts of the former in a uniform manner and so to build up an even thickness. The final weight of the ball before vulcanization amounts to 45.6 grams. The ball is then immediately placed in a ball mould of 2.28" internal diameter and vulcanized. After vulcanization, the ball is covered with felt in the usual manner.

On cutting through the vulcanized rubber cover of a ball properly made from calendered tape, it is found that the tape consolidates to a continuous rubber mass and except on its free surface shows no evidence of tape-winding construction. Further, the physical tests on balls made as indicated, have been found to be fully equal to balls made from ordinary ⅛" thick calendered sheets.

EXAMPLE 2

Calendered tape tennis balls

A ball is constructed as in Example 1, but the thin spherical rubber former is covered with compounded rubber tape (of approximate composition rubber 80, sulphur 2, amorphous carbon 15, zinc oxide 2, accelerator 1) prepared from compounded latex by spreading on glass, drying and cutting into strips. Vulcanization of the ball is effected as previously.

EXAMPLE 3

Seamless latex dipped ball

A rubber bladder is used of type already described, except that before the blowing agents are added, the inside of the bladder is coated with impermeable dope to increase the air-retaining qualities of the finished ball. The inside of the rubber sealing cap is also coated with impermeable dope, except where it is to be cemented. Finally, the outside of the completed and sealed bladder is coated all over with the dope, and allowed to stand for some time before the dipping operations begin. Any suitable dope may be used, which, for preference is very flexible. The dope used consists of a mixture of glyptal resin, gelatine and glycerine of the type described and claimed in copending application 713,376, filed February 28, 1934.

The special impermeable bladder is then dipped a total of 14 times in a thick compounded latex dispersion and given a substantial coating of compounded rubber by latex-dipping, the dipping operations being carried out so as to build up a uniform rubber deposit. Half the ball is dipped at each immersion. After every two dippings, the equatorial overlap is completely covered by the following two dips. The ball is rotated through an angle of approximately 30° after every two dips, so that no two dippings ever occur over exactly the same area. After each dipping, the deposited latex is coagulated by brief immersion in the vapour above warm acetic acid.

After the final immersion, there is produced a ball of very smooth appearance, showing only a slight dipping-mark around the circumference. The gross weight is 67.2 grams; the ball is then set aside for a few days at room temperature to dry, when the weight becomes reduced to 51.1 grams.

Vulcanization is effected in the usual type of mould.

The various features of the invention are illustrated in the accompanying drawing in which—

Fig. 1 is a sectional view of the nucleus sealed before the application of the seamless wall; Fig. 2 is a view illustrating the coating of the nucleus with the successive layers of latex rubber; Fig. 3 is a view of the alternative method of winding tape on the nucleus and Fig. 4 is a sectional view of the finished ball.

In the drawing the nucleus 10 has been slit at 11 to permit the removal of a former on which it has been formed. This slit 11 is closed by a cap or catch 12 which is cemented onto the outer wall of the nucleus. The inner surface 13 of the nucleus may have been coated with a coating impermeable to gases to render the completed ball more nearly gas proof. A small pellet 14 of gas generating material may be positioned in the nucleus before sealing it with the cap 12. The nucleus may then be filled with air or other gas

to inflate it to the desired size. It is then ready to receive and support the layers or coatings of rubber to form the seamless wall structure.

In the method of building up a wall structure by successively coating the nucleus with deposits of rubber from an aqueous dispersion, as illustrated in Fig. 2, the nucleus 10 immersed in a bath 15 of aqueous rubber dispersion of suitable composition. The nucleus is preferably coated for about one-half or a little over of its surface. With each coating, the coatings are alternated and overlapping, so that a complete coverage is obtained with each two dippings. These layers may be alternated in position to obtain uniformity.

In the method of building up a wall structure by winding flat compounded rubber tape thereon as illustrated in Fig. 3, a tape 16 of ribbon-like or other suitable shape, is wrapped on the nucleus so as to obtain an even distribution and is then compacted, the componued rubber merging into one seamless mass as the rubber is vulcanized.

The resulting structure is as shown in Fig. 4 in which a very thin wall of nucleus 10 remains on which has been built a seamless wall 17. The two merge on vulcanization into a single unitary structure. The inner surface 13 of the nucleus may have been coated with composition impermeable to gases and in this case will remain in the finished ball to improve its gas retaining qualities.

The seamless latex balls built on an impermeable bladder as described have superior air-retaining qualities, as compared with ordinary balls made from thick calendered sheet rubber in the standard manner.

Having now particularly described our invention, we claim—

1. The method of forming seamless, hollow rubber balls of substantially uniform wall thickness, which comprises forming a nucleus consisting of a thin walled hollow spherical body of rubber having a wall thickness of only a small fraction of the wall thickness of the ball to be formed, and then building up on the outside surface of said nucleus a seamless uniform layer of rubber of a wall thickness of about ten or more times that of said nucleus, and uniting said nucleus and said built up wall layer to an integral structure by vulcanization.

2. The method of claim 1 in which the wall is built on said nucleus by successive deposits of unmasticated compounded rubber from an aqueous dispersion thereof.

3. The method of claim 1 in which the wall is built up on said nucleus by winding unvulcanized rubber tape thereon until a wall is built and in which said windings are united into a seamless, uniform and integral structure with said nucleus by vulcanization.

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