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(54) **SEWN BALL AND MANUFACTURING METHOD THEREOF**

(57) A sewn ball includes an inner tube and a housing (4). The inner tube includes a tube body (1), a yarn layer (2) and a rubber layer (3), wherein the yarn layer is attached to an external surface of the tube body, the rubber layer is attached to an external surface of the yarn layer and is then vulcanized, in such a manner that a rubber raw material of the rubber layer permeates through yarn

gaps of the yarn layer, so as to integrate the tube body, the yarn layer with the rubber layer. The housing (4) wraps around and is attached to the inner tube (1). The sewn ball provided by the present invention has excellent bouncing ability, high strength, good durability, small circumferential error, and excellent balance and flight stability.

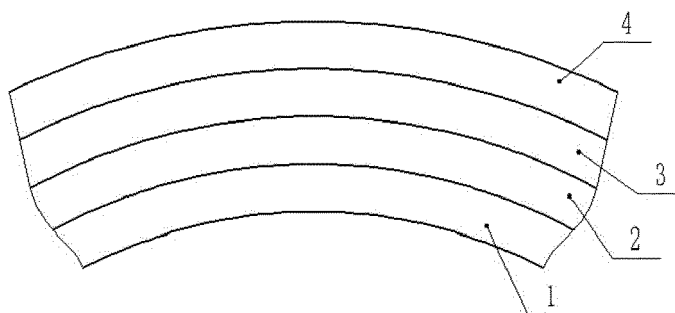


Fig. 1

Description

CROSS REFERENCE OF RELATED APPLICATION

[0001] The present invention claims priority to CN 201610156079.6, filed Mar. 18, 2016.

BACKGROUND OF THE PRESENT INVENTION

Field of Invention

[0002] The present invention relates to the field of sports goods, and more particularly to a sewn ball and a manufacturing method thereof.

Description of Related Arts

[0003] The inner tube of conventional sewn balls, such as sewn footballs and sewn volleyballs, includes three structural forms as follows: (1) rubber inner tube; (2) yarn tire by winding a layer of yarn around the exterior of the rubber inner tube; and (3) cloth tire by attaching a layer of cloth to the exterior of the rubber inner tube. Shortcomings of the above three structural forms are respectively described as below.

[0004] Shortcomings of the first structure are: firstly, due to the flexibility, the rubber inner tube is able to expand unlimitedly without forming while being injected with the gas, and the expanding force is directly applied to the housing, so that the housing easily bursts to expose seaming lines till the ball finally bursts; secondly, the rubber inner tube has poor gas tightness, after a long period, the sufficient gas gradually slowly leaks, so that the gas always needs to be added, thereby it is not convenient for usage; thirdly, the gas nozzle of the rubber inner tube is located at one side thereof, the gas nozzle and a circle of the yarn reinforcement layer, which is around the gas nozzle and attached to the rubber inner tube, allow the center of gravity of the whole ball to trend to the side where the gas nozzle is located, so that the center of gravity of the ball is unbalanced, which leads to unstable flight.

[0005] Shortcomings of the second structure are: a layer of yarn is wound around the exterior of the rubber inner tube, and the basic circumference of the rubber inner tube is restrained with the yarn to set the shape of the rubber inner tube and increase the striking breaking strength of the ball. However, after the yarn tire is injected with the gas, the whole ball is hard and easily hits hands. Simultaneously, once the whole ball is hard, flight balance becomes poor when the ball flies. Accordingly, the hard ball not only has poor rebound, but also results in poor sense control force of the player. Furthermore, during the manufacturing process of the yarn tire, the yarn is mechanically wound around the rubber inner tube, and however, the mechanical wound yarn tire is unable to ensure the circumferential error of the ball, the circumferential error generally reaches 3-5 mm, which leads to

poor balance and bouncing ability, and unstable flight of the ball.

[0006] Shortcomings of the third structure are: a layer of cloth is attached to the exterior of the rubber inner tube to form the cloth tire. For example, Chinese Patent No. 201020150442.1 discloses a football, which includes a sheath and a liner, wherein a layer of cloth is located between the sheath and the liner. Compared with the yarn tire, the cloth tire has soft surface after being injected with the gas. However, the cloth tire, obtained by replacing the yarn with the cloth, has poor forming, low striking breaking strength of the ball, and large circumferential error (in generally, which reaches 3-5 mm), so that it has poor bouncing ability, poor balance, unstable flight, insufficient strength and poor durability.

[0007] Therefore, the rubber inner tube is able to continuously expand with the increase of the internal gas, so that it is unable to control the ball to achieve the determined shape and size, thus the gas leakage easily appears. In spite that the yarn tire is able to avoid a burst during tire inflation and plays a role in forming, due to the ball is mechanically wound with yarns, the yarns are always unevenly wound, so that the ball is unable to be completely controlled to achieve the determined shape. Similarly, in spite that the cloth tire is able to play a role in forming, the cloth has various latitude and longitude lines, which leads to uneven tensions, so that it is unable to completely control the ball to achieve the determined shape.

[0008] During the manufacturing process of conventional sewn footballs, the housing thereof comprises 20 regularly hexagonal leather pieces and 12 regularly pentagonal leather pieces. Accordingly, these leather pieces need to be attached or sewn one by one, and there are at least 32 attaching or sewing actions. The more attaching or sewing actions there are, the lower productive efficiency. Furthermore, the attaching or sewing is highly difficult and low in accuracy, so that the manufactured ball is bad to handle and avoiding circumferential error cannot be ensured. To reduce the number of leather pieces of the housing for decreasing the difficulties of attaching or sewing, Chinese Patent No. 201320488758.5 discloses a ten-piece sports football, which comprises external leather forming a spherical surface, wherein the external leather comprises two integrally formed four-leather-units and eight integrally formed three-leather-units; every integrally formed four-leather-unit comprises two regularly hexagonal leather pieces and two regularly pentagonal leather pieces, the two regularly hexagonal leather pieces and the two regularly pentagonal leather pieces are arranged in a straight line, the two regularly hexagonal leather pieces are located at a middle of the straight line, the two regularly pentagonal leather pieces are respectively located at two sides of the straight line; every integrally formed three-leather-unit comprises two regularly hexagonal leather pieces and one regularly pentagonal leather piece, the two regularly hexagonal leather pieces and the regularly pentagonal leather piece

are arranged in a straight line, the two regularly hexagonal leather pieces are connected with each other, the regularly pentagonal leather piece is connected with one of the two regularly hexagonal leather pieces. In spite of the fact that this Chinese patent reduces the amount and the difficulty of the attaching or sewing, and increases the accuracy thereof, during the cutting the leather pieces, the four-leather-units and the three-leather-units are large in length, so that the raw materials are wasted. Therefore, once this football is produced on a large scale, the raw materials and the input cost of the raw materials are greatly increased.

SUMMARY OF THE PRESENT INVENTION

[0009] An object of the present invention is to overcome shortcomings of the prior art for providing a sewn ball which has excellent bouncing ability, high strength, good durability, small circumferential error, and excellent balance and flight stability.

[0010] Accordingly, in order to accomplish the above object, the present invention provides a sewn ball, in accordance with claims which follow, which comprises an inner tube and a housing, wherein the inner tube comprises a tube body, a yarn layer and a rubber layer; the yarn layer is attached to an external surface of the tube body, the rubber layer is attached to an external surface of the yarn layer and is vulcanized, in such a manner that a rubber raw material of the rubber layer permeates through yarn gaps of the yarn layer, so as to integrate the tube body, the yarn layer with the rubber layer; wherein the housing wraps around and is attached to the inner tube.

[0011] Preferably, the sewn ball is a sewn football or a sewn volleyball.

[0012] Preferably, a balance plate is provided on the inner tube and located at a position where it is coaxially aligned with a gas nozzle and symmetrical to a spherical center.

[0013] Preferably, the thickness of the yarn layer is 0.1-1 mm.

[0014] Preferably, the circumferential error of the sewn ball is less than 2 mm.

[0015] Preferably, the housing comprises 6-32 leather pieces.

[0016] Preferably, the tube body is a double layer tube body comprising an internal layer body and an external layer body tightly attached to the internal layer body.

[0017] Preferably, the rubber layer is an ordinary rubber layer or a foamed rubber layer; after vulcanization, an external surface of the rubber layer forms a layer of dense rubber membrane.

[0018] Preferably, the rubber layer comprises an internal layer rubber, a yarn reinforcement layer and an external layer rubber, wherein the internal layer rubber is attached to an interior of the yarn layer, the yarn reinforcement layer is attached to an external surface of the internal layer rubber, the external layer rubber is attached

to an external surface of the yarn reinforcement layer.

[0019] The present invention also provides a method of manufacturing a sewn ball, which comprises steps of:

(1) cutting leather into a plurality of leather pieces with a leather cutter, and then sewing the leather pieces according to a spherical surface leather piece arrangement order to form a housing, and meanwhile, leaving 1-4 edges of the housing as an opening;

(2) preparing an inner tube, comprising:

(2A) preparing a tube body conforming to the roundness of a ball;

(2B) preparing a yarn ball comprising injecting gas into the tube body, and measuring a periphery thereof, winding yarns around an external surface of the tube body with a yarn winding machine;

(2C) preparing a rubber raw material ball by attaching a rubber raw material to an external surface of the yarn ball; and

(2D) preparing a vulcanizing inner tube comprising the steps of: putting the rubber raw material ball prepared by the step (2C) into a vulcanizing mould, communicating a gas injection needle on the vulcanizing mould with a gas nozzle of the rubber raw material ball and pressurizing, heating and vulcanizing with a vulcanizing temperature of 95-160 °C, a pressure of 3-10 kg/cm² and a vulcanizing time of 4-10 min, permeating the rubber raw material through yarn gaps after vulcanization, and vulcanizing mould unloading for obtaining the inner tube;

(3) coating or not coating a binder on a surface of the inner tube obtained by the step (2);

(4) coating a glue around an air hole of the housing obtained by the step (1) and the gas nozzle of the inner tube obtained by the step (2);

(5) putting the inner tube into the housing from the opening thereof, cementing after corresponding the gas nozzle of the inner tube to the air hole of the housing, and sewing the opening of the housing to prepare a pretreated sewn ball; and

(6) injecting gas into the pretreated sewn ball obtained by the step (5) to form a round ball, putting the round ball into a reshaping mould, pressurizing and reshaping with a pressure of 3-10 kg/cm², a time of 1-8 min, and a mould temperature of 30-70 °C for attaching the housing to the surface of the inner tube,

and cleaning a surface of the housing, thereby obtaining the sewn ball, wherein a circumferential error of the sewn ball is less than 2 mm.

[0020] Preferably, after the rubber raw material ball is prepared in step (2C), a balance plate is attached to a position where it is coaxially aligned with the gas nozzle and symmetrical to a spherical center on the rubber raw material ball, and then step (2D) is processed.

[0021] Beneficial effects of the present invention are as follows:

(1) In the present invention, the yarn layer is wound around the external surface of the tube body, and the rubber layer is attached to the external surface of the yarn layer. After vulcanization, the rubber raw material of the rubber layer permeates through the yarn gaps of the yarn layer, in such a manner that the tube body, the yarn layer and the rubber layer form a whole, which has a compact structure, excellent gas tightness, high strength and good durability. The thickness of the yarn layer provided by the present invention is preferably 0.1-1 mm. Under the premise of guaranteeing enough restraint of the yarn layer to the tube body injected with gas, the thickness of the yarn layer is properly selected for improving the strength of the inner tube, and simultaneously giving consideration to both the hardness of the ball after being injected with gas and the bouncing ability of the ball. Furthermore, after vulcanization with the vulcanizing mould, the rubber raw material of the rubber layer attached to the external surface of the yarn layer permeates through the yarn gaps of the yarn layer, to form the inner tube which sandwiches the yarn between the external rubber and the internal rubber, so that the surface softness of the ball injected with gas is ensured, and meanwhile, the circumferential error of the ball is greatly reduced, thereby greatly improving the rebound ability of the ball.

(2) The balance plate is located at a position where it is symmetrical to the gas nozzle on the inner tube for allowing the center of gravity of the manufactured ball to lie in the spherical center, so that the ball has excellent balance and flight stability of the ball is ensured. Therefore, when a player hits the ball, an actual flight trajectory of the ball deviates from an ideal trajectory thereof in only a very small way, so that a hit rate of the ball is increased.

(3) After vulcanizing the inner tube with the vulcanizing mould and pressurizing the inner tube with the reshaping mould, the circumferential error of the inner tube and the circumferential error of the sewn ball can be respectively accurately ensured, so that the obtained sewn ball has a small circumferential error, excellent bouncing ability and balance, and stable flight.

(4) Furthermore, the tube body provided by the present invention is a double layer tube body comprising an internal layer body and an external layer body tightly attached to the internal layer body, wherein the internal layer body is an ordinary single tube, the external layer body can limit the internal layer body to evenly expand to a needed shape and size, a hardness-softness and a degree of bouncing of the internal layer body, so that any leakage phenomenon is effectively avoided to improve a service life of the ball.

(5) In spite of the fact that existing yarn tire is able to avoid a burst during tire inflation and plays a role in forming, when a ball is mechanically wound with yarns, the yarns are always unevenly wound, so that the ball is unable to be completely controlled to achieve a determined shape. To solve the above technical problem, the rubber layer of the present invention further adopts sandwiching the yarn reinforcement layer between the internal layer of rubber and the external layer of rubber. By a double forming of the yarn layer and the yarn reinforcement layer, the ball is completely controlled to achieve the determined shape, so that when the ball is squeezed in a long term and strongly impacted, the yarn reinforcement layer enhances the strength of the impact resistance of the ball, thus ensuring a resilience strength and an excellent bouncing ability and prolonging the service life of the ball.

[0022] These and other objectives, features, and advantages of the present invention will become apparent from the following detailed description, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is a partially structurally schematic view of a sewn ball provided by the present invention.

Fig. 2 is a partially structurally schematic view of the sewn ball according to the Embodiment 3 of the present invention.

Fig. 3 is a partially structurally schematic view of a double layer tube body according to the Embodiment 5 of the present invention.

Fig. 4 is a partially structurally schematic view of a rubber layer according to the Embodiment 6 of the present invention.

Fig. 5 is a schematic view of a housing of the present invention.

In the drawing, 1: tube body; 2: yarn layer; 3: rubber layer; 4: housing; 5: inner tube; 6: gas nozzle; 7: balance plate; 8: air hole; 1-1: internal layer body; 1-2: external layer body; 3-1: internal layer rubber; 3-2: yarn reinforcement layer; 3-3: external layer rubber; 4-1: dual-leather-unit; 4-2: four-leather-unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] The present invention is further described in detail with reference to the accompanying drawings.

Embodiment 1

[0025] Referring to the drawing, a sewn ball is illustrated, comprising an inner tube 5 and a housing 4, wherein the inner tube 5 comprises a tube body 1, a yarn layer 2 and a rubber layer 3, wherein the yarn layer 2 is attached to an external surface of the tube body 1; the rubber layer 3 is attached to an external surface of the yarn layer 2 and is then vulcanized, in such a manner that a rubber raw material of the rubber layer 3 permeates through the yarn layer 2, so as to integrate the tube body 1, the yarn layer 2 with the rubber layer 3; and the housing wraps around and is attached to the inner tube 5.

Embodiment 2

[0026] If the thicker yarn layer 2 winds around the tube body 1, a surface of the manufactured inner tube 5 is harder, so that a bouncing ability of a ball is affected; and meanwhile, if the thinner yarn layer 2 winds around the tube body 1, the yarn layer 2 is unable to sufficiently bind up the tube body 1, so that the inner tube 5 has low strength, poor damage resistance and is not durable. To avoid the above situations, preferably, a thickness of the yarn layer 2 is 0.1-1 mm. Under a premise of guaranteeing enough restraint of the yarn layer 2 to the tube body 1, the thickness of the yarn layer 2 is properly selected for improving the strength of the inner tube 5, and simultaneously giving consideration to both the surface hardness and the bouncing ability of the ball.

Embodiment 3

[0027] As shown in Fig. 2, if balance and flight stability of the ball are ensured, when a player hits the ball, an actual flight trajectory of the ball deviates from an ideal trajectory thereof in only a very small way, so that a hit rate of the ball is increased. Accordingly, a balance plate 7 is located on the inner tube 5 provided by the present invention, and is coaxially aligned with a gas nozzle 6 and symmetrical to a spherical center, such that the whole center of gravity of the ball lies in the spherical center.

Embodiment 4

[0028] The rubber layer 3 of the present invention is an ordinary rubber layer or a foamed rubber layer. After vulcanization, an external surface of the rubber layer 3 forms a layer of dense rubber membrane. While the foamed rubber layer is adopted, after vulcanization, the surface of the inner tube 5 forms numerous foaming holes, so that the ball is soft, and meanwhile, the external surface of the rubber layer 3 forms the layer of dense rubber membrane, thus a gas tightness of the ball is improved and a leakage of gas inside the ball is avoided. Therefore, the ball has excellent gas tightness and a compact structure.

Embodiment 5

[0029] As shown in Fig. 3, preferably, the tube body 1 is a double layer tube body comprising an internal layer body 1-1 and an external layer body 1-2 tightly attached to the internal layer body, wherein the internal layer body 1-1 is an ordinary single tube, the external layer body 1-2 is able to limit the internal layer body 1-1 to evenly expand to a needed shape and size, and a hardness-softness of the internal layer body, so that any leakage phenomenon is effectively avoided to improve the service life of the ball.

Embodiment 6

[0030] As shown in Fig. 4, preferably, the rubber layer 3 comprises an internal layer rubber 3-1, a yarn reinforcement layer 3-2 and an external layer rubber 3-3, wherein the internal layer rubber 3-1 is attached to an interior of the yarn layer 2, the yarn reinforcement layer 3-2 is attached to an external surface of the internal layer rubber 3-1, the external layer rubber 3-3 is attached to an external surface of the yarn reinforcement layer 3-2. In spite of the fact that an existing yarn tire is able to avoid a burst during tire inflation and plays a role in forming, when a ball is mechanically wound with yarns, the yarns are always unevenly wound, so that the ball is unable to be completely controlled to achieve a determined shape. To solve this technical problem, the rubber layer 3 of the present invention further adopts sandwiching the yarn reinforcement layer 3-2 between the internal layer rubber 3-1 and the external layer rubber 3-3. By a double forming of the yarn layer 2 and the yarn reinforcement layer 3-2, the ball is completely controlled to achieve the determined shape, so that when the ball is squeezed in the long term and strongly impacted, the yarn reinforcement layer 3-2 enhances the strength of impact resistance of the ball, thus ensuring a resilience strength and an excellent bouncing ability and prolonging the service life of the ball.

[0031] In the above embodiments, the sewn ball of the present invention is a sewn football or a sewn volleyball.

[0032] The housing of the present invention comprises 6-32 leather pieces. These leather pieces are sewn and

connected with each other to form the housing of the sewn ball, 1-4 edges which are not sewn are left to act as an opening for installing the inner tube.

[0033] Referring to Fig. 5, preferably, when the sewn ball is a sewn football, the housing 4 comprises eight integrally formed dual-leather-units 4-1 and eight integrally formed four-leather-units 4-2, wherein every dual-leather-unit 4-1 comprises two regular hexagon leather pieces connected with each other; every four-leather-unit 4-2 comprises three regular pentagon leather pieces and a regular hexagon leather piece, the three regular pentagon leather pieces are not adjacent to each other and are connected with the regular hexagon leather piece. The structure of the housing 4 reduces the amount of leather pieces thereof, decreases the amount of sewing of the leather pieces, reduces sewing difficulty, and meanwhile, saves raw materials, and improves integral roundness of the spherical surface of the sewn football. Compared with ten leather pieces, the present invention is able to better use residual materials, and save costs of raw materials, thereby better meeting needs for sewing footballs in mass production.

[0034] According to the structural description of the above embodiments, a manufacturing method of the sewn ball provided by the present invention is provided, which comprises steps of:

(1) cutting a leather into a plurality of leather pieces with a leather cutter, and then sewing the leather pieces according to a spherical surface leather piece arrangement order to form a housing 4, and meanwhile, leaving 1-4 edges of the housing 4 as an opening;

(2) preparing an inner tube 5, comprising:

(2A) preparing a tube body 1 fittingly with a roundness of a ball;

(2B) preparing a yarn ball comprising injecting gas into the tube body 1, and measuring a periphery thereof, winding yarns around an external surface of the tube body 1 with a yarn winding machine;

(2C) preparing a rubber raw material ball by attaching a rubber raw material to an external surface of the yarn ball; and

(2D) preparing a vulcanizing inner tube 5 comprising steps of: putting the rubber raw material ball prepared by the step (2C) into a vulcanizing mould, communicating a gas injection needle on the vulcanizing mould with a gas nozzle 6 of the rubber raw material ball and pressurizing, heating and vulcanizing with a vulcanizing temperature of 95-160 °C, a pressure of 3-10 kg/cm² and a vulcanizing time of 4-10 min, permeating the

rubber raw material through yarn gaps after vulcanization, and vulcanizing mould unloading for obtaining the inner tube 5;

(3) coating or not coating a binder on a surface of the inner tube 5 obtained by the step (2), wherein the binder is preferably emulsion or waterborne glue;

(4) coating glue around an air hole 8 of the housing obtained by the step (1) and the gas nozzle 6 of the inner tube 5 obtained by the step (2);

(5) putting the inner tube 5 into the housing 4 from the opening thereof, cementing after corresponding the gas nozzle 6 of the inner tube 5 to the air hole 8 of the housing 4, and sewing the opening of the housing 4 to prepare a pretreated sewn ball; and

(6) injecting gas into the pretreated sewn ball obtained by the step (5) to form a round ball, putting the round ball into a reshaping mould, pressurizing and reshaping with a pressure of 3-10 kg/cm², a time of 1-8 min, and a mould temperature of 30-70 °C for attaching the housing 4 to the surface of the inner tube 5, and cleaning a surface of the housing 4, thereby obtaining the sewn ball, wherein the circumferential error of the sewn ball is less than 2 mm.

[0035] Preferably, referring to Fig. 2, after the rubber raw material ball is prepared in the step (2C), a balance plate 7 is attached to a position where is coaxially aligned with the gas nozzle 6 and symmetrical to a spherical center on the rubber raw material ball, and then the step (2D) is processed. The balance plate 7 is a rubber plate with a weight equivalent to the gas nozzle. The balance plate 7 ensures that the center of gravity of the whole ball lies in the spherical center so as to avoid the ball to deviate from the spherical center for affecting the flight stability of the ball.

[0036] During the manufacturing process of the inner tube 5, while vulcanizing with the vulcanizing mould, the rubber raw material of the rubber layer 3 permeates through the yarn gaps of the yarn layer 2, in such a manner that the tube body 1, the yarn layer 2 and the rubber layer 3 form a whole to form the inner tube 5 sandwiching the yarns between an inner rubber and an outer rubber, which has compact structure and excellent gas tightness, not only ensures a surface softness after injecting the gas into the inner tube 5, but also increases a rebound ability, and simultaneously, the vulcanizing mould ensures that the circumferential error of the vulcanizing inner tube 5 prepared by vulcanizing mould unloading is in an error range, thereby greatly improving the bouncing ability, balance and flight stability of the ball, avoiding the circumferential error of the inner tube 5 to accumulate to the housing, which leads to a larger accumulated circumferential error of the ball, and affects the bouncing ability, the balance and the flight stability of the ball.

[0037] After putting the inner tube 5 into the housing 4, the opening is sewn, the sewn ball is then put into the reshaping mould, pressurized and reshaped, so as to ensure that the circumferential error of the obtained sewn ball is less than 2 mm. The present invention overcomes the shortcomings of the prior art, and puts the inner tube 5 into the housing 4 after coating the binder on the surface of the inner tube 5 or directly puts the inner tube 5 into the housing 4 without coating the binder on the surface of the inner tube 5, which leads to the uncontrollable circumferential error of the surface of the housing 4. In general, the circumferential error of conventional sewn balls reaches 3-5 mm. Accordingly, the ball has poor bouncing ability, poor balance and unstable flight. Furthermore, the inner tube 5 obtained by the prior art is vulcanized with the vulcanizing mould, so that the circumferential error of the obtained inner tube 5 is similarly unable to be controlled, thereby leading to large circumferential error of the inner tube 5 and directly affecting the circumferential error of the sewn ball.

[0038] The circumferential error of the sewn ball provided by the present invention is less than 2 mm, that of the inner tube 5 is controlled with the vulcanizing mould, and that of the sewn ball is controlled with the reshaping mould. The circumferential error of the inner tube 5 and the sewn ball gives consideration to both the bouncing ability of the ball and the manufacturing cost of production, which includes a control cost of a circumferential accuracy of an internal surface of the vulcanizing mould and the reshaping mould.

[0039] According to the Embodiment 4, to improve the gas tightness of the inner tube 5, after the rubber raw material ball is prepared in the step (2C), the surface of the inner tube 5 prepared by vulcanizing mould unloading forms the layer of dense rubber membrane, so that the inner tube 5 has excellent gas tightness and durability.

[0040] The above description shows the basic principles, main characteristics and advantages of the invention. One skilled in the art will understand that the embodiments of the present invention as shown in the drawings and described above are exemplary only.

Claims

1. A sewn ball, comprising an inner tube (5) and a housing (4), wherein the inner tube comprises a tube body (1), a yarn layer (2) and a rubber layer (3); the yarn layer is attached to an external surface of the tube body, the rubber layer is attached to an external surface of the yarn layer and is vulcanized, in such a manner that a rubber raw material of the rubber layer permeates through yarn gaps of the yarn layer, so as to integrate the tube body, the yarn layer with the rubber layer; wherein the housing wraps around and is attached to the inner tube.
2. The sewn ball, as recited in claim 1, wherein a bal-

ance plate (7) is provided on the inner tube (5) and located at a position where is coaxially aligned with a gas nozzle and symmetrical to a spherical center.

3. The sewn ball, as recited in claim 1, wherein a circumferential error of the sewn ball is less than 2 mm, and a thickness of the yarn layer (2) is 0.1-1 mm.
4. The sewn ball, as recited in claim 1, wherein the tube body (1) is a double layer tube body comprising an internal layer body (1-1) and an external layer body (1-2) tightly attached to the internal layer body.
5. The sewn ball, as recited in claim 1, wherein the rubber layer (3) is an ordinary rubber layer or a foamed rubber layer; after vulcanization, an external surface of the rubber layer forms a layer of dense rubber membrane.
6. The sewn ball, as recited in claim 1, wherein the rubber layer (3) comprises an internal layer rubber (3-1), a yarn reinforcement layer (3-2) and an external layer rubber (3-3), wherein the internal layer rubber is attached to an interior of the yarn layer (2), the yarn reinforcement layer is attached to an external surface of the internal layer rubber, the external layer rubber is attached to an external surface of the yarn reinforcement layer.
7. The sewn ball, as recited in any one of claims 1 to 6, wherein the sewn ball is a sewn football or a sewn volleyball, or wherein the housing (4) comprises 6-32 leather pieces.
8. A method of manufacturing a sewn ball, comprising the steps of:

(1) cutting a leather into a plurality of leather pieces with a leather cutter, and then sewing the leather pieces according to a spherical surface leather piece arrangement order to form a housing (4), and meanwhile, leaving 1-4 edges of the housing as an opening;

(2) preparing an inner tube, comprising:

- (2A) preparing a tube body (1) fittingly with a roundness of a ball;
- (2B) preparing a yarn layer (2) comprising injecting gas into the tube body, and measuring a periphery thereof, winding yarns around an external surface of the tube body with a yarn winding machine;
- (2C) preparing a rubber raw material layer (3) by attaching a rubber raw material to an external surface of the yarn layer; and
- (2D) preparing a vulcanizing inner tube (5) comprising steps of: putting the rubber raw material layer prepared by the step (2C) into

a vulcanizing mould, communicating a gas injection needle on the vulcanizing mould with a gas nozzle of the rubber raw material layer and pressurizing, heating and vulcanizing with a vulcanizing temperature of 95-160 °C, a pressure of 3-10 kg/cm² and a vulcanizing time of 4-10 min, permeating the rubber raw material through yarn gaps after vulcanization, and vulcanizing mould unloading for obtaining the inner tube;

(3) coating or not coating a binder on a surface of the inner tube (5) obtained by the step (2);
 (4) coating a glue around an air hole (8) of the housing obtained by the step (1) and the gas nozzle of the inner tube (5) obtained by the step (2);
 (5) putting the inner tube (5) into the housing from the opening thereof, cementing after corresponding the gas nozzle of the inner tube to the air hole (8) of the housing (4), and sewing the opening of the housing to prepare a pretreated sewn ball; and
 (6) injecting gas into the pretreated sewn ball obtained by the step (5) to form a round ball, putting the round ball into a reshaping mould, pressurizing and reshaping with a pressure of 3-10 kg/cm², a time of 1-8 min, and a mould temperature of 30-70 °C for attaching the housing to the surface of the inner tube (5), and cleaning a surface of the housing (4), thereby obtaining the sewn ball, wherein a circumferential error of the sewn ball is less than 2 mm.

9. The method as recited in claim 8, wherein after the rubber raw material layer (3) is prepared in the step (2C), a balance plate (7) is attached to a position where is coaxially aligned with the gas nozzle and symmetrical to a spherical center on the rubber raw material layer, and then the step (2D) is processed.
10. The method as recited in claim 8, wherein the sewn ball comprises an inner tube (5) and a housing (4), wherein the inner tube comprises a tube body (1), a yarn layer (3-2) and a rubber layer (3-3); the yarn layer is attached to an external surface of the tube body, the rubber layer is attached to an external surface of the yarn layer and is then vulcanized, in such a manner that a rubber raw material of the rubber layer permeates through yarn gaps of the yarn layer, so as to integrate the tube body, the yarn layer with the rubber layer; the housing wraps around and is attached to the inner tube.
11. The method as recited in claim 8, wherein a circumferential error of the sewn ball is less than 2 mm, and a thickness of the yarn layer is 0.1-1 mm.

12. The method as recited in claim 8, wherein the tube body (1) is a double layer tube body comprising an internal layer body and an external layer body tightly attached to the internal layer body.
13. The method as recited in claim 8, wherein the rubber layer (3) is an ordinary rubber layer or a foamed rubber layer; after vulcanization, an external surface of the rubber layer forms a layer of dense rubber membrane.
14. The method as recited in claim 8, wherein the rubber layer comprises an internal layer rubber (3-1), a yarn reinforcement layer (3-2) and an external layer rubber (3-3), wherein the internal layer rubber is attached to an interior of the yarn layer (2), the yarn reinforcement layer is attached to an external surface of the internal layer rubber, the external layer rubber is attached to an external surface of the yarn reinforcement layer.
15. The method as recited in any one of claims 8 to 14, wherein the sewn ball is a sewn football or a sewn volleyball, or wherein the housing (4) comprises 6-32 leather pieces.

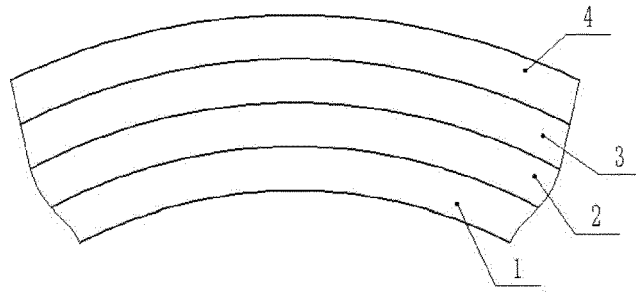


Fig. 1

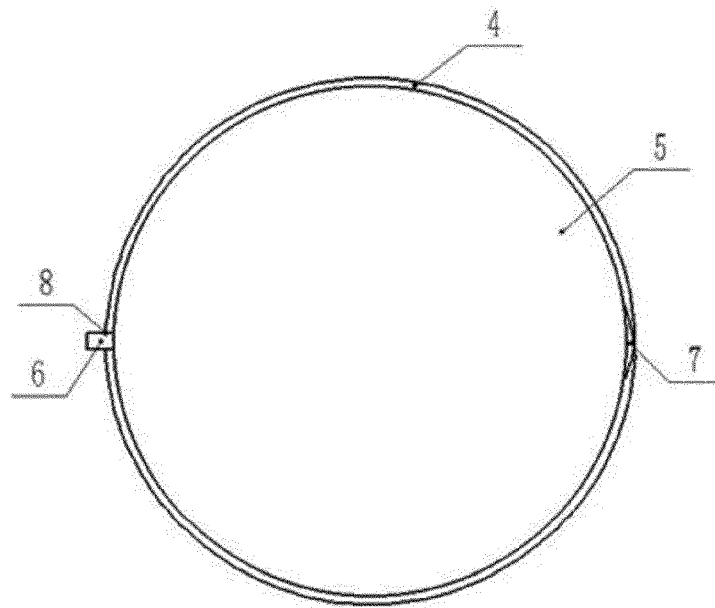


Fig. 2

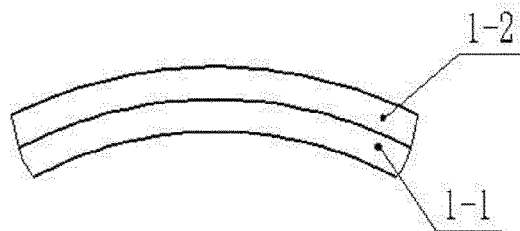


Fig. 3

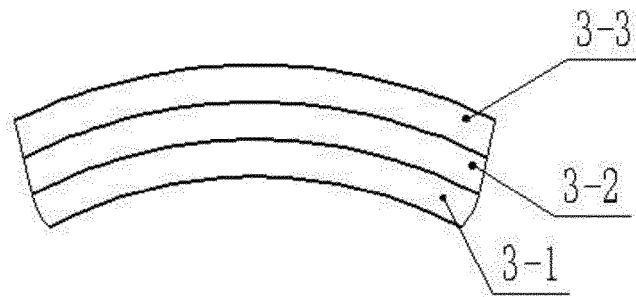


Fig. 4

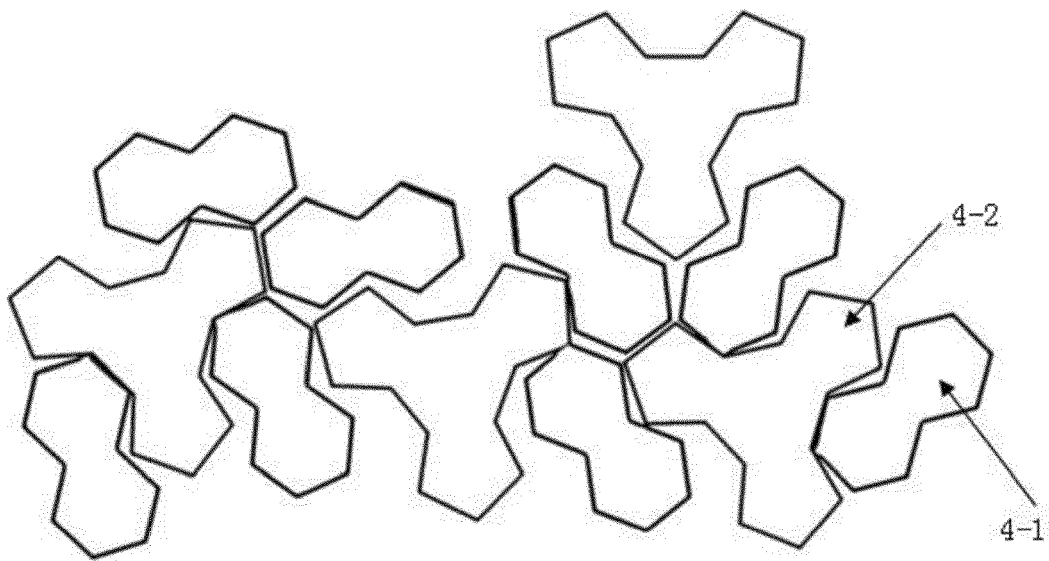


Fig. 5



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