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(54) **A MULTI-FUZE GAMING OBJECT**

(57) A multi-fuze gaming object for enhanced strength, superior bounce and durability on rough grounds. The invention encompasses gaming objects comprising plurality of layers maneuvered around an air-impermeable bladder and layered casing for better cushioning effect to ensure better gaming experience.

The invention more specifically covers superior quality sports-/game-balls essentially made of rubber blends, used in games of the like of soccer, baseball, rugby etc. constructed using weather proof materials in a stitch-less manner for enhanced shelf-life and higher performance.

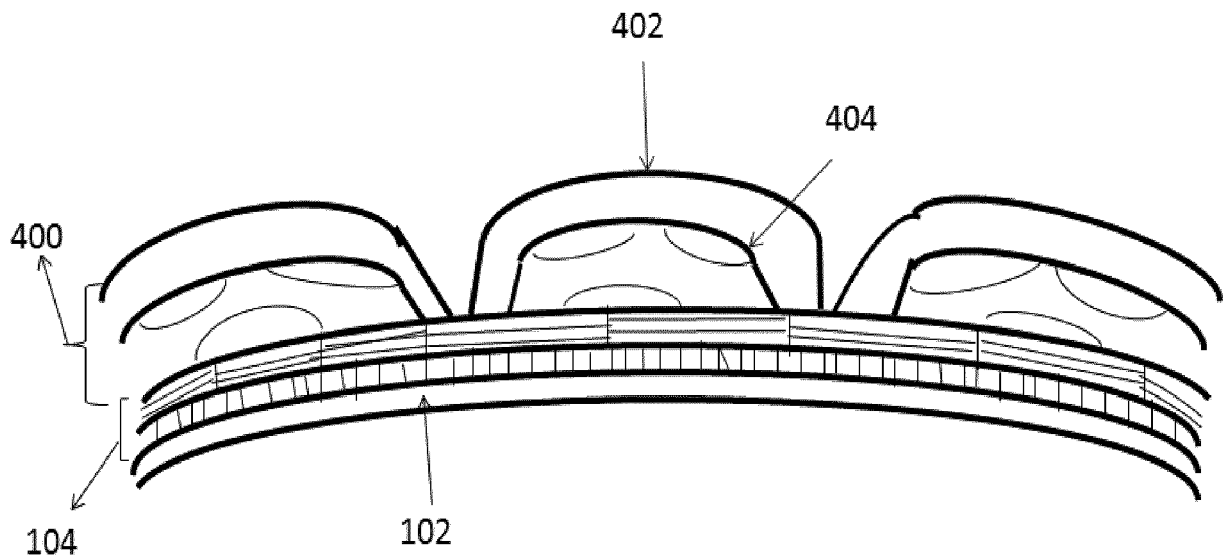


Fig 4

**Description****FIELD OF INVENTION**

**[0001]** The present invention generally relates to gaming objects and is more specifically directed to durable gaming objects comprising plurality of layers maneuvered around an inflatable bladder for enhanced strength, rebound and superior air retention. The invention further relates to a multi-fuze object used in games of the like of soccer, netball, handball, rugby etc. constructed using weather proof materials in a stitch-less manner for enhanced shelf-life and higher performance.

**BACKGROUND**

**[0002]** A typical gaming object of a pre-defined shape, for example a soccer-ball or a rugby-ball or an unconventional object like a punching bag, usually comprises at least a bladder or a core on the inside and a cover or casing that surrounds it. The portion of the ball excluding the cover is conventionally referred to as the carcass. Historically, gaming objects have of pre-defined shapes like sports/ game-balls, are usually comprise an inflatable rubber inner bladder and elastic outer casing (cover). Typically, the rubber bladder is inflated, and molded under heat and pressure followed by vulcanization. Of late, the bladder is known to derive strength from intermediate layer over the bladder forming a layered carcass wherein the bladder is wound with reinforcing thread which forms a layer of windings. The thread may be dipped in latex or adhesive. The carcass is then covered with an appropriate cover or casing before the object can be used for the desired sport or game.

**[0003]** Commercially available inflated game-balls are typically made up of materials like artificial leather, or thermoplastic polyurethane (TPU) based material, preferably, polyvinyl chloride (PVC) and/ or Polyurethane. These materials, however, lack durability on rough grounds and their effectiveness is limited to grassy and soft ground surface. Further, another drawback of using these materials is their limited durability. With changes in weather conditions, gaming objects made from PVC or PU get decomposed thereby having an undesirably short shelf life. Another problem with construction using leather panels elastically supported by intermediate windings is the non-uniform cushion effect. It is significant to ensure that the gaming object is appropriately and uniformly cushioned for less impact on foot/ hand while kicking/ punching/ catching along with appropriate bounce.

**[0004]** Further, it is important to ensure that the outer casing capable of supporting internal pressurization. The outer casing need not be substantially air impermeable while the inner bladder provides the air barrier such that upon inflation, the outer casing is stretched tightly over the internally pressurized rubber inner bladder for high resiliency, rebound and liveliness for use. The bladders available in the market possess either low air permeabil-

ity or good bounce and rebound capabilities, but not both superior resiliency and air retention. This is evidenced by FIFA's (Federation Internationale de Football Association) international match-ball standards for gaming object/ball used in soccer. Their standard for shape retention is less than 2% ball sphericity, which is challenging, and for ball-rebound is at least 115 cm at roomtemperature and at least 110 cm at low-temperature, which is also challenging. However, the standard only requires that game-balls inflated to 1 atmosphere of air pressure can lose no more than 25% air pressure after 3 days elapsed time, which is passable by nearly any conventional rubber bladder material. So far, none of the commercially available gaming objects, have not been able to achieve a bladder technology that provides for roundness, resiliency and liveliness while also providing superior air retention.

**[0005]** Inflatable bladders have been known to be produced by several different processes. A large number of bladders are made by latex rubber dip molding and curing. Their strengthening is done using nylon or elastic threads wound around the bladder body lacking much required cushioning effect. These bladders are popular because, for example, natural rubber latex dipped bladders exhibit very good resilience and playability characteristics. However, they exhibit poor air retention. Also, when in the inflated but unstretched state, these bladders form non-ideal shapes. The elements/ layers of the carcass are generally glued which stiffens the bladder thereby compromising on quality.

**[0006]** The casing typically comprises a plurality of panels attached onto the bladder, wherein said panels are either machine stitched or hand stitched or moulded or pasted. Most of the balls marketed in the world today are hand stitched or machine stitched which tend to have limited productivity due to dependability on highly skilled workers. There are several other disadvantages for the stitching structure of gaming objects. For example, the casing panels, being stitched onto the bladder, involve expensive and time-consuming manufacturing procedures, yet the resulting gaming object may not have the optimal roundness. One particularly-pressing problem for conventional stitched gaming objects is that the casing panels cannot have too sharp a shape as it is difficult for sharp concerns to be adequately stitched with adjacent casing panels.

**[0007]** Thus, there is a need to develop a stitch less gaming object having a strong carcass providing rebound, air impermeability as well as resilience, uniformly cushioned with casing that is durable, has a greater shelf life as well as has high performance. The present invention aims to achieve all of the above, and more, by the aforementioned problems of conventional gaming objects.

**SUMMARY OF THE INVENTION**

**[0008]** The present invention relates to gaming objects

having an inflatable, air impermeable bladder of a pre-defined shape, strengthened using a reinforcing fabric layer wrapped around the bladder and covered with layered casing for enhanced bounce, superior resilience and constructed in the same shape as that of the bladder.

**[0009]** It is a purpose of the invention to provide for a new and improved gaming object having high performance and increased durability on rough grounds characterized by use of rubber on the upper surface as well as the bladder. Further, the invention provides for increased shelf life of the gaming object characterized by use of weather proof materials. Furthermore, the invention also enhances shape retention and rebound of the gaming objects by giving strength to the bladder as well as the casing. Also, the invention aims at reduction of dependability on scarce skilled labour and provides for stitch free manufacturing process, thereby increasing productivity.

**[0010]** The invention covers a multi-fuze gaming object which comprises of at least three sections. First section is an air impermeable, inflatable rubber bladder, wherein said bladder hosts a mouth valve for locking compressed air inside it. Second section is a multi-layer fabric covering that encloses the bladder, wherein said covering further comprises at least two layers of fabric. The first layer is affixed on to the bladder along a first axis, say in the horizontal fashion, while the second layer is affixed on the first layer along a second axis, say in vertical fashion.

**[0011]** The third section, a layered casing affixed over the multi-layer fabric covering, is the outermost covering of the gaming object. The layered casing comprises at least two layers, an outer layer and an inner layer which are affixed together, wherein, the inner layer comprises a rubber blended foaming sheet and the outer layer, covering the inner layer, comprises a blended rubber layer affixed to at least one layer of polyester fabric. All the layers that are formed in each of the three sections of the gaming object are affixed securely using an adhesive agent.

### BRIEF DESCRIPTION OF DRAWINGS

#### **[0012]**

Fig. 1 depicts the carcass and casing of a multi-fuze gaming object

Fig. 2 depicts the top view of a mouth valve embedded in the bladder.

Fig. 3 depicts the linings along different axes of the multi-layer fabric covering.

Fig. 4 depicts the cross sectional view of the layers of a sports-/game-ball, particularly used in soccer.

Fig. 5 depicts the cross sectional view of the layers of the outer layer of the casing of the sports-game-ball which is a rubber sheet with polyester fabric.

Fig. 6 depicts the formation of panels using two layers to be joined together to form the layered casing.

### DETAILED DESCRIPTION OF THE INVENTION

**[0013]** In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, that the present invention may be practiced without these specific details or with varied combinations of such details.

**[0014]** The description in ensuing paragraphs cover exemplary embodiments of the present invention which are described in sufficient detail to enable those skilled in the art to practice the invention, but other embodiments may be utilized and logical, mechanical, geometrical, and other changes may be made without departing from the scope of the present invention. Therefore, following detailed description is not to be taken in a limiting sense, and the scope of the present invention is defined only by the appended claims.

**[0015]** Several features are described hereafter that can each be used independently of one another or with any combination of other features. However, an individual feature might only address one of the problems discussed above. Some of the problems discussed above might not be fully addressed by any of the features described herein.

**[0016]** The invention encompasses a multi-layered gaming object fused together to give enhanced performance and gaming experience. The gaming object is made of two distinct sections viz. a carcass and a layered casing manufactured for a superior and enhanced gaming experience.

**[0017]** The carcass has a moulded rubber bladder of a predefined shape as its base and is strengthened by an intermediate layer comprising a multilayer fabric covering affixed on the bladder using an adhesive agent modified to ensure that the bladder does not stiffen, a problem suffered in conventional gaming objects. The carcass is vulcanized and rested to provide strength and retain the shape which when coated with the adhesive agent helps to maintain the desired rebound.

**[0018]** The layered casing that covers the carcass is also made up of rubber as the primary material to ensure superiority in durability and finishing to the gaming object. The layers of the casing comprises at least two portions, one outer layer which covers or wraps an inner layer, affixed together with the adhesive agent modified for this invention. The outer layer of the layered casing is essentially made from blended rubber polymer which is strengthened with at least one layer of polyester fabric for better shape retention. The inner layer of the layered casing is formed of a rubber blended foaming sheet for the desired cushioning effect while retaining the bounce. All these materials are weather proof which increases shelf life of the gaming object and the durability on the rough grounds. The entire construction of the multi-fuze

gaming object is stich-less thereby enhancing productivity, controlling cost and reducing dependability on skilled labour force.

**[0019]** In a preferred embodiment, the gaming object is an inflatable game-/sports-ball which is used in games of the like of tennis, soccer, basketball, rugby to name a few. Alternatively, the invention encompasses alternative gaming objects like punching bags also which are not necessarily game-/sports-balls but require the same features and properties, none-the-less. The physical properties like resilience, durability, bounce, cushioning effect, impact shelf-life, abrasion-resistance etc. are absolutely essential for an enhanced gaming experience especially in national and international level competitions where the relevant gaming object has to not only meet the standards specified by the tournament/ competition but also give high performance.

**[0020]** As an illustration, **Figure 1** of the drawings depicts the preferred gaming object i.e. sports-/game-ball, which encompasses the multi-fuze structure having a carcass 100 and a layered casing 106.

**[0021]** As described in the paragraphs above, the gaming object encompassed by the present invention comprises the core of the carcass is an inflatable bladder 102 which is the first layer providing shape and surface for building the sports-/game-ball. In a preferred embodiment, bladder 102 is a hollow body which has compressed air in it, of predefined shape, depending upon the kind of sport/ game it is being made for, for instance, round and large for a soccer-ball, oval and hard for a rugby ball. The bladder 102 is preferably made up of butyl blended rubber to maximize its air impermeability properties.

**[0022]** In an embodiment, the bladder 102 composition is a blend of Natural rubber & halo-butyl, wherein the preferable halogen group is bromine, forming bromobutyl which helps in air retention. Accordingly, the blend ratio can range from an 80% Natural Rubber and 20% Bromobutyl composition to a 20% Natural Rubber and 80% Bromobutyl composition, depending upon the amount of air retention desired in the gaming object.

**[0023]** In a preferred embodiment the method of preparation and imparting strength to the butyl bladder 102 is ensured by curing. As an illustration said method has been explained herein; the blended rubber composition is converted into thin layer of sheet which may vary from the range of 0.7mm to 1.00 mm, preferably falling within the range of 0.8mm to 1.0mm. This sheet is cut into a predefined shape using conventional die cutting machines. In the uncured bladder a mouth valve 108 is fixed. To balance the weight of the bladder 102 a small rubber compound patch is pasted on opposite side of the mouth valve 108. This uncured bladder is put in a vulcanization mold, preferably made up of steel and air is inserted into it. The air pressure in the closed mold is variable but preferable range is from 5kg to 6kg. The pressurized bladder then undergoes vulcanization for 5-15 minutes, preferable 8-10 minutes, at a temperature range of 100°C

to 200 °C, more specifically at a range of 145°C to 150°C.

**[0024]** In an embodiment of the invention, the vulcanization mold is characterized by grooves producing bladders designed with additional rims running throughout the surface. This gives extra strength and stability to the bladder post vulcanization.

**[0025]** In another embodiment of the invention, the uncured rubber composition is treated with activators. The step of vulcanizing the rubber composition chemical reaction typically starts at very slow rate which can take hours. The activators speed up the cross linking or curing process chemically and help to get to the final product within minutes. The activators preferred in the present invention are of the like of Zinc Oxide, Stearic Acid etc., which help in enhancing the curing rate of the blended composition.

**[0026]** In yet another embodiment, the desired physical properties of the butyl blended rubber are further enhanced by addition of fillers. The fillers preferably used are silica, carbon and the like which heighten the physical properties of the bladder like tensile elongation, tear strength etc., depending upon the type of gaming object being made.

**[0027]** The invention further encompasses a specially designed mouth valve 108 for further ensuring air retention as illustrated in **Figure 2** of the drawings. The mouth valve 108 used are those known conventionally for locking compressed air in the bladder 102. In an embodiment of the inventions, a valve housing is arranged on the inner surface of the bladder, and having a cavity penetrated through said housing, through which a pneumatic inflation valve is inserted and fixed. The passage penetrating through the pneumatic inflation valve receives an inflation needle in the length-wise direction to compress the air inside and prevent the bladder from getting flat.

**[0028]** In a preferred embodiment, after curing and vulcanization process is complete, the bladder is grinded evenly throughout the surface to open its pores. This step prepares the bladder for next layer which is affixed using an adhesive agent, wherein the pores help said adhesive to penetrate into it allowing the next layer to be affixed securely.

**[0029]** In a preferred embodiment, the adhesive agent comprises a water-based binder mixed with a hardener which encourages early drying of the layers being fixed. The water-based binders used may be of the like of latex, essentially being rubber based with 40% water or polyurethane based adhesive also having significant water content. The binders are mixed with hardeners in the ratio 0.2% to 0.3%, which facilitate early drying.

**[0030]** The carcass 100 of the sports-/game-ball also comprises a reinforcing intermediate layer between the bladder 102 and the casing 106 comprising a plurality of fabric layers 104. The invention encompasses at least two sheets of fabrics pasted over one another along different axes.

**[0031]** In a preferred embodiment, the first lining fabric sheet substantially covers the bladder in one direction,

say vertical i.e. along the y-axis, to form a first lining. A portion of one first lining of fabric may overlap a portion of another first lining of fabric to give strength to the edges. The second lining of fabric is pasted diagonally or horizontally i.e. along the y-axis substantially surrounding the first lining and covering its edges for enhanced strength. Referring to **Figure 3** of the drawing, it is illustrated that the bladder is covered with the multi-layer fabric 104 covering to form a strong carcass. Each layer of fabric is a flexible thin member, preferably made of a cloth, depending upon the type of sports-/game-ball being prepared. Alternatively, it can be made of other materials, such as, for example, woven fabrics, unwoven fabrics, threads or other conventional flexible sheet material.

**[0032]** The invention envisages that the first layer of fabric is attached to an adhesive impregnated bladder by allowing it to stand for 15-50 minutes, preferably 15, or heating it at 30-60C for 2-12 minutes. This helps in drying the moisture content and ensuring strong adhesion. In an embodiment the first layer is applied to the bladder, while the bladder is inflated so that the first layer assumes the same shape.

**[0033]** Once the high strength fabric layer is pasted substantially covering the whole surface, it is coated with adhesive agent for attaching it to overlapping sheet. The second layer is then pasted diagonally/ along a different axis to the first layer to give strength to the edges of the first layer fabric. The purpose is to reinforce the bladder to retain its original shape and to minimize the expansion of the bladder up to 1%. The invention, in one embodiment, envisages, that the bladder with second layer of fabric pasted with adhesive agent is again coated with the adhesive agent for smooth finishing and is kept to get dry naturally for 15-50 minutes. It can also be made to be given heat treatment as done for first layer of fabric.

**[0034]** The invention, in a preferred embodiment, encompasses that curing and vulcanization should be done after applying adhesive agent above the second layer of fabric for better binding of fabric on bladder. The bladder is put into the vulcanization mold preferably made up of Aluminum and air pressure is inserted into it which, optimally, in closed a mold ranges from 5 Kg to 15Kg. The bladder is then vulcanized typically for 8-15 minutes at 100-200 °C, preferably between 140-145°C.

**[0035]** In another embodiment the carcass is dipped or brushed with adhesive agent and rested or heated appropriately (as describe above) for smoothening the outer surface of the carcass and facilitating better pasting of the outer casing on it.

**[0036]** The invention covers a layered casing 106 over the carcass of the gaming object to provide the necessary cushion while ensuring that the durability on rough surfaces and increased shelf life. As illustrated in **Figure 4**, that depicts the layers of the outer casing of the invention, there is an outer layer 402 and an inner layer 404 of the casing affixed together, wherein the inner layer comprises the rubber blended foaming sheet providing the cush-

ioning effect and the outer layer comprises the rubber blended with polyester fabric for durability and resilience.

**[0037]** In a preferred embodiment of the invention, as shown in **Figure 4**, the rubber blended foaming sheet forming the inner layer 404 of the casing, is formed from a blend of rubber polymers and co-polymers masticated together to form a polymer compound. The materials used as co-polymers for blending may be of the like of Ethylene Vinyl Acetate (EVA), Thermo Plastic Polyethylene (TPE) etc. The rubber blended compound is blown with a foaming agent, preferably EVA, and converted into a sheet. This sheet serves dual purpose which includes retaining of bounce and second gives cushioning effect to the ball. An illustrative inner layer may comprise a blend of Ethyl Vinyl Acetate (EVA) & Natural Rubber in the ratio of say 90% EVA and 10% Natural Rubber.

**[0038]** In an embodiment, during the mastication process of the rubber blend, additives are added to enhance its physical properties. The blend may include additives of the like of fillers like silica and calcium, curatives like peroxides, accelerators like zinc oxide, stearic acids, processing oils etc. Along with all or any of the above additives, a blowing agent (ADCL (Azodicar Bonamide) or OBSH (Oxydibenzenesulfonyl Hydrazide)) is used to blow the blended sheet with added foaming agent.

**[0039]** The invention achieves the required cushioning effect by vulcanization of the rubber blended compound after it is blown with a foaming agent which in turn converted it into a foaming sheet. In an embodiment, the vulcanization process is the same as that done for the carcass. In another embodiment, the moulds are not rectangular, but round in shape. Alternatively, the temperature preferable ranges from 160-165C for a preferable time of 30-50 minutes.

**[0040]** In a preferred embodiment of the invention, the rubber sheet with polyester fabric, forming the outer layer 402 of the casing, is formed from a layer polyester fabric 502 laminated onto a rubber layer 504 with adhesive agent.

**[0041]** In a preferred embodiment, as illustrated in **Figure 5**, the uppermost layer of the sports-/game-ball primarily of rubber. The rubber layer of this laminated outer sheet formed from a blend of Synthetic and Natural rubbers, with a preferable thickness of 0.5mm to 1.0mm. The formulation is made to enhance its physical properties such as high rebound and resilience, high abrasion resistance and all weather resistance property.

**[0042]** In an embodiment of the invention, the rubber compound used is a blend of Natural & Synthetic Rubber Polymers in 50-50 ratio along with additives such as silica, titanium, zinc oxide, etc. for enhanced properties.

**[0043]** The invention achieves the desired outer layer properties by several steps. The blended rubber layer 504 is laminated on a polyester fabric sheet 502 which enhances the tearing strength of the rubber layer. The laminated layer is then vulcanized followed by a second layer of polyester fabric being laminated with the help of adhesive agent. The laminated sheet is then dried and

moisture of the water-based binder is removed.

**[0044]** In an embodiment, the uncured blended rubber compound and a polyester fabric is put through a calendaring machine. The thin layer of rubber compound is laminated on the fabric. A transfer paper example Polyester or Cellophane, preferably having design on it, is pasted on the layer of rubber compound for making the gaming object presentable. Additionally, such transfer paper also serves as the base for logos or labels or written inscriptions for purposes of branding and sale. The fabric laminated rubber sheet is then directly put for vulcanization in a hot press or any other conventional means and is then kept between two pre heated plates, preferably made of steel, for vulcanization.

**[0045]** In an embodiment the vulcanization is done at 100-200C, preferably at 130 to 135°C for 5-50 minutes, preferably for 10 minutes.

**[0046]** In a preferred embodiment, and as illustrated in **Figures 1 and 4**, the casing 106 of the gaming object is formed of closely laminated smaller panel units, without and space between adjacent panel units (hereinafter referred to as panels). As an illustration, where the sport-/game-ball is for soccer, the panels 400 are polygonal in shape, preferably a pentagon, laminated over the carcass with close spacing between any two adjacent panels. Alternatively, where the game is basketball, the panels are dumbbell shaped and comparatively lesser in number.

**[0047]** As illustrated in **Figure 6**, where the casing comprises polygonal panels, the outer layer 402 i.e. Rubber Layer 504 with polyester fabric 502, laminated onto the inner layer 404, i.e. Rubber blended Foaming Sheet, is first cut into desired shape, say pentagon for soccer-ball, separately. The shape for both inner and outer layers are the same but the outer sheet 402 is cut slightly bigger than the inner layer 404. The difference in size varies from 2mm to 5mm. The panel 400 is prepared by folding the edges of the outer layer 402, completely wrapping the inner layer from all sides, affixed using the adhesive agent.

**[0048]** The panels 400 thus formed is then laminated, manually or with machine, in a stitch less manner on the surface of bladder leaving no space between them. The panels are pasted so as to completely cover the entire carcass. The finally laminated panels are pressed in a mould, preferably of aluminum, having pressure of approximately 6 kg to 12 kg, preferably 8-9kg, for 3-10 minutes.

**[0049]** In an embodiment, the panels pasted on the carcass is pressed in a shaping mould to avoid peeling of panels for better durability. This also helps to remove unevenness of the panels on the outer surface. In yet another embodiment, the channels between the panels are run with adhesive agent to ensure better bonding, low water absorption and for ensuring that the adjacent panels stick with each other tightly.

**[0050]** In the foregoing specification, embodiments of the invention have been described with reference to nu-

merous specific details that may vary from implementation to implementation. The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense. The sole and exclusive indicator of the scope of the invention, and what is intended by the applicants to be the scope of the invention, is the literal and equivalent scope of the set of claims that issue from this application, in the specific form in which such claims issue, including any subsequent correction.

## Claims

1. A multi-fuze gaming object, comprising:

an air impermeable, inflatable rubber bladder, wherein said bladder hosts a mouth valve for locking compressed air inside the bladder;  
 a multi-layer fabric covering, enclosing the bladder, wherein said covering further comprises, at least two layers of fabric, wherein the first layer is affixed on to the bladder along a first axis, while the second layer is affixed on the first layer along a second axis;  
 a layered casing, affixed over the multi-layer fabric covering, wherein said casing comprises at least two layers, further comprising at least one outer layer and at least one inner layer, affixed together,

wherein further, said at least one inner layer comprises a rubber blended foaming sheet; and said at least one outer layer, covering the inner layer, comprises a blended rubber layer affixed to at least one layer of polyester fabric; and

an adhesive agent for affixing securely the layers of said gaming object.

2. The gaming object as claimed in Claim 1, wherein the bladder is composed of butyl blended rubber.

3. The gaming object as claimed in Claim 1 or 2, wherein the bladder contains surface pores for the adhesive agent to penetrate and affix securely.

4. The gaming object as claimed in any one of Claims 1 to 3, wherein the rubber blended foaming sheet comprises,

a blend of rubber polymers and co-polymers masticated together; and  
 a foaming agent, vulcanized together and converted into a sheet.

5. The gaming object as claimed in Claim 4, wherein the blend further comprises one or more additives

selected from a group of fillers, curatives, silica, zinc oxide, stearic acids, processing oils and the like.

6. The gaming object as claimed in any one of Claims 1 to 5, wherein the adhesive agent comprises a water-based binder and a hardener. 5
7. The gaming object as claimed in any one of Claims 1 to 6, wherein the layered casing is formed from smaller panel units, affixed adjacent to each other, to cover the gaming object. 10
8. The gaming object as claimed in Claim 7, wherein said casing comprises at least two panel units, laminated adjacent to each other with the adhesive agent. 15
9. The gaming object as claimed in Claim 7, wherein each panel unit comprises the at least one outer layer wrapped over the at least one inner layer. 20

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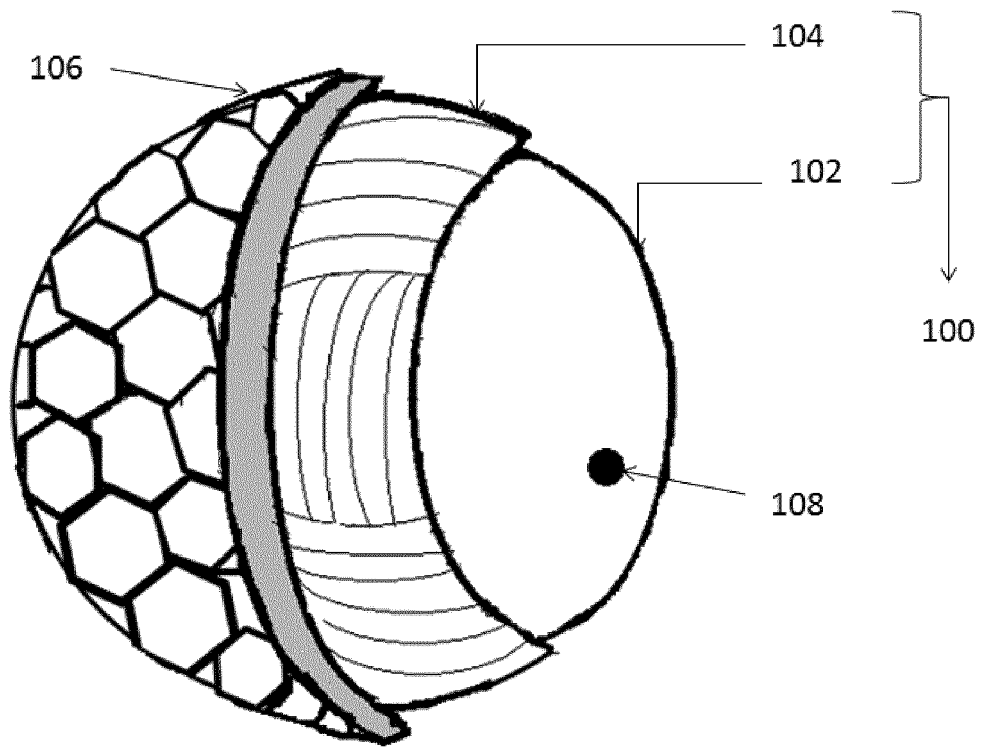


FIG. 1



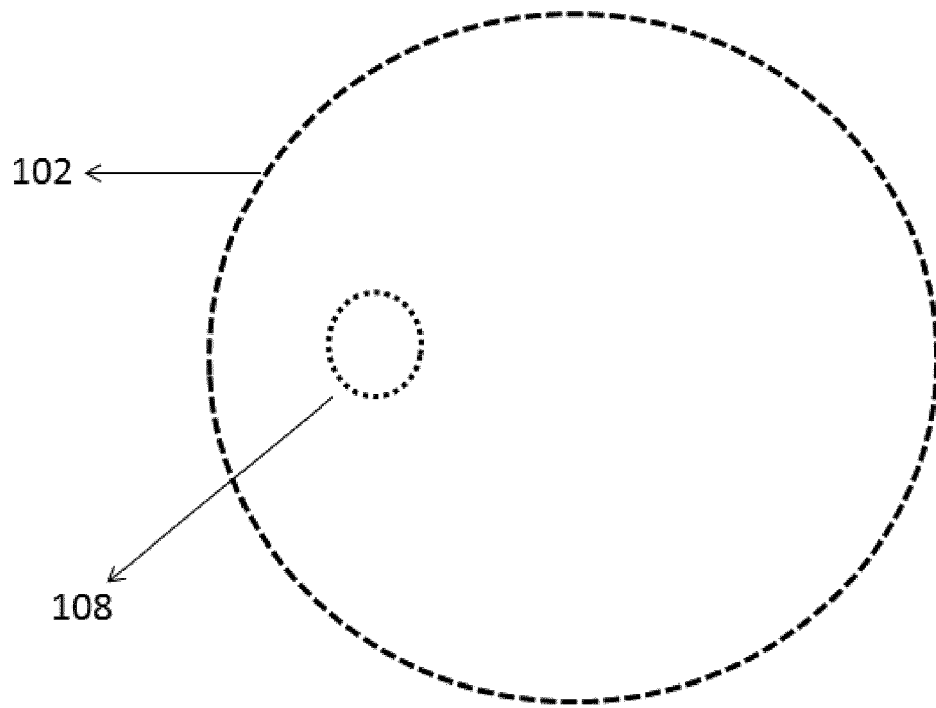


Fig 2

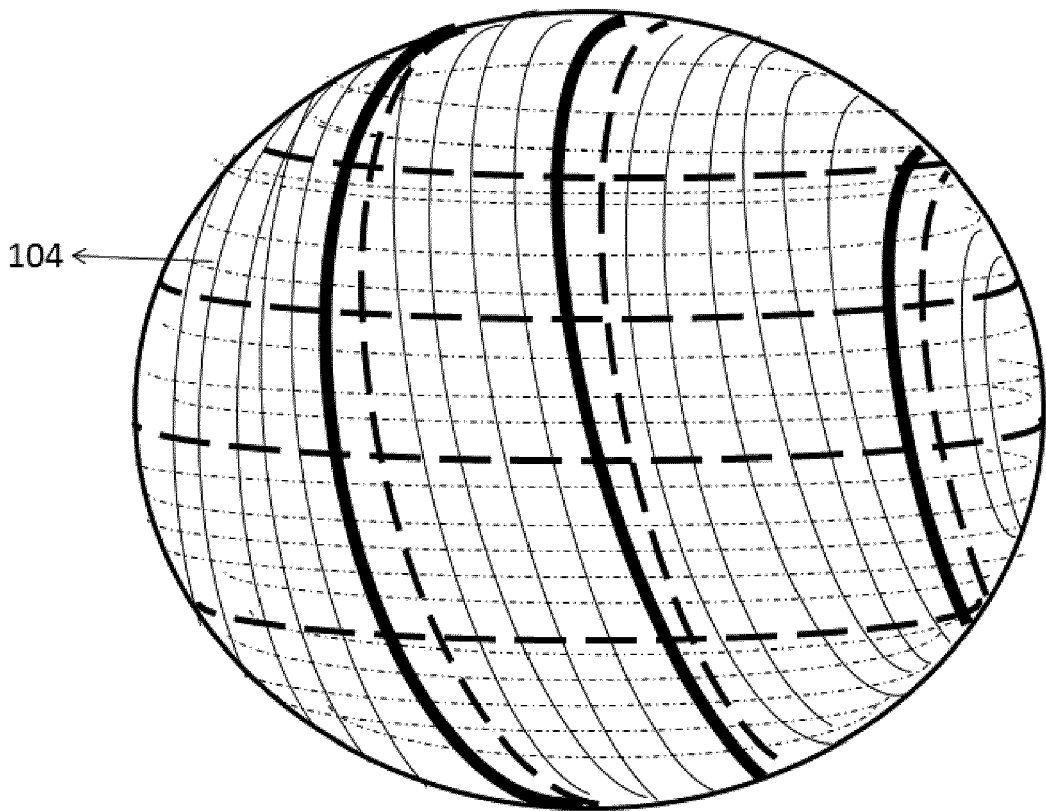


Fig 3.

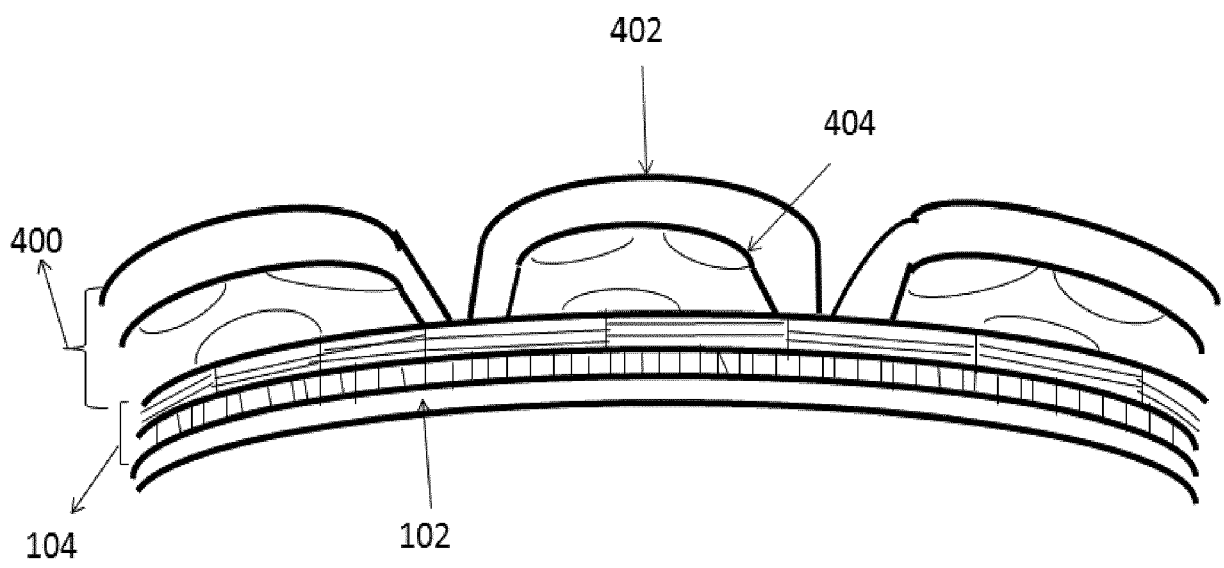


Fig 4

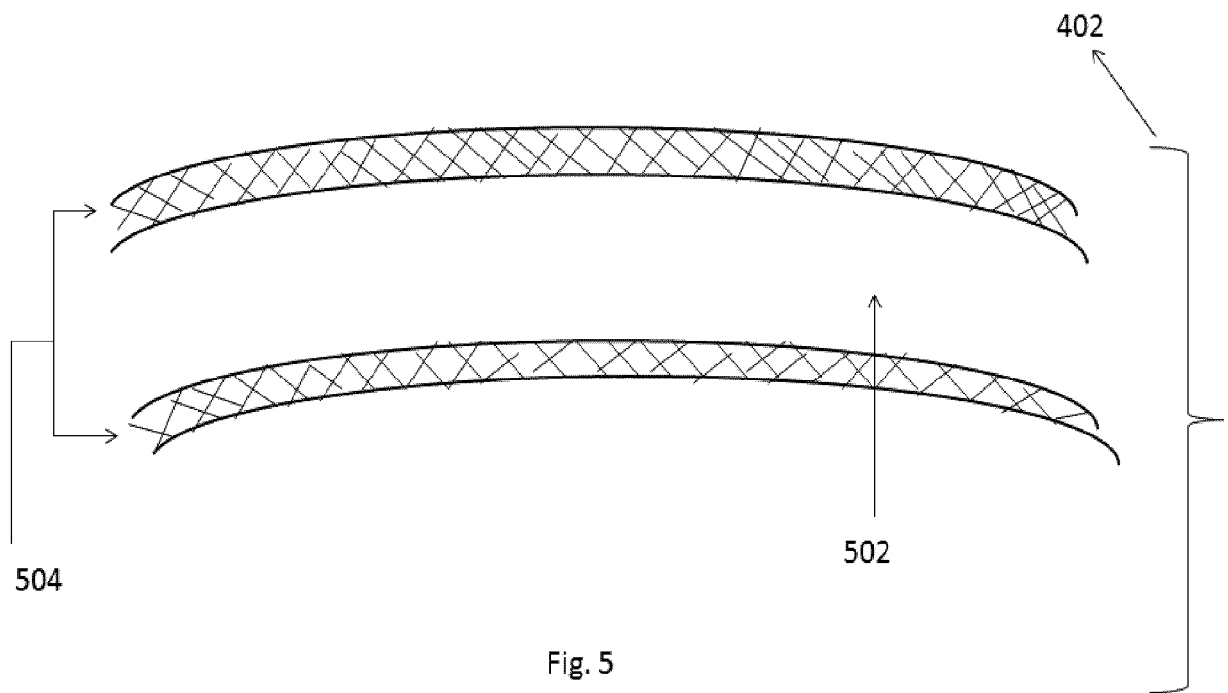
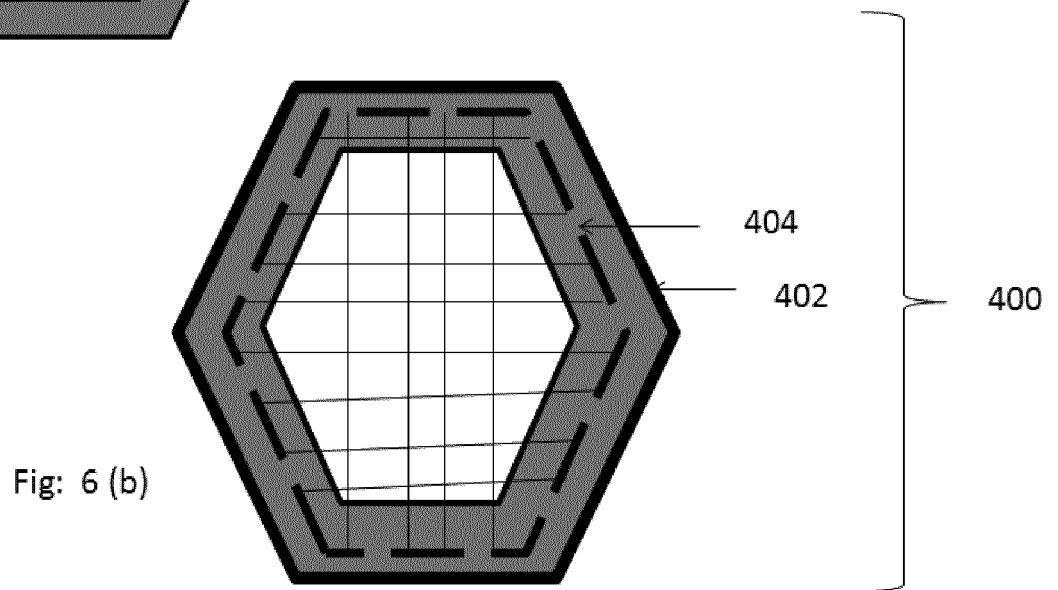
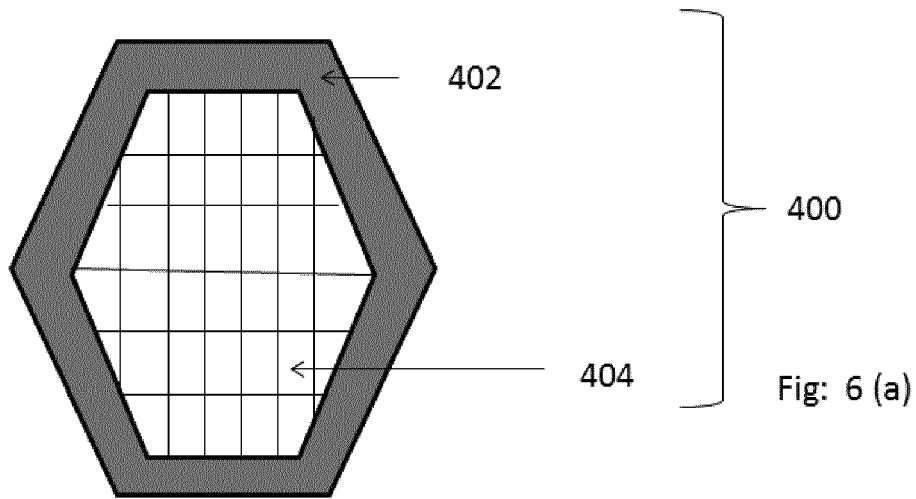


Fig. 5





EUROPEAN SEARCH REPORT

Application Number  
EP 16 19 4325

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 January 2017	Examiner Jekabsons, Armands
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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