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(54) **LOW COMPRESSION GOLF BALL**

(57) **ABSTRACT**

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This invention relates to the use of chemical compounds to trap carbon-centered radicals during the golf ball curing process. The intended end result is a golf ball that has lower compression due to a decrease in crosslink density while retaining sufficient crosslink density to impart durability to the golf ball and either maintain or increase the resiliency of the golf ball. The subject invention more specifically discloses a golf ball which is comprised of a solid core and a resin cover wherein the core is produced by curing a composition comprising an elastomeric polymer, a free radical initiator, a radical crosslinking agent, and at least one carbon-centered radical trap, wherein the carbon-centered radical trap is free of sulfur, and wherein the carbon-centered radical trap is not a stable free radical. The present invention further discloses a process for manufacturing a golf ball core which comprises (1) blending a mixture of an elastomeric polymer, a free radical initiator, a radical crosslinking agent, and at least one carbon-centered radical trap to produce a golf ball core composition, wherein the carbon-centered radical trap is free of sulfur, and wherein the carbon-centered radical trap is not a stable free radical, (2) compressing the golf ball core composition into an essentially spherical shape to produce an uncured golf ball core and (3) heating the uncured golf ball core at an elevated temperature to produce a cured golf ball core.

LOW COMPRESSION GOLF BALL

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/616,110, filed on Oct. 5, 2004, and incorporates herein by reference the teaching thereof in their entirety.

FIELD OF THE INVENTION

[0002] This invention relates to the use of chemical compounds to trap carbon-centered radicals during the golf ball curing process. The intended end result is a golf ball that has lower compression due to a decrease in crosslink density while retaining sufficient crosslink density to impart durability to the golf ball and either maintain or increase the resiliency of the golf ball.

BACKGROUND OF THE INVENTION

[0003] Golfers desire golf balls with high resiliency, which translates into improved flight distance. While desiring a long flight distance, golfers are also accustomed to a particular range of feel and sound from the golf ball. In general, an increase in resiliency can be obtained by manipulating the golf ball formulation. The problem with this approach however, is that augmentations to the formulation that would result in improved resiliency typically increase the rigidity of the golf ball. This increase in rigidity translates into a decreased feel for the player. As a result, there has traditionally been a trade-off in the design of golf ball cores between hitting feel and distance. The longstanding goal of golf ball manufacturers has been to construct golf balls capable of long flight distance without compromising a soft feel.

[0004] In general, golf balls may be divided into two categories: solid and wound. The wound golf ball has been viewed as a premier ball given its soft feel and high spin rate. Wound golf balls typically include a solid or fluid-filled center surrounded by a tensioned elastomeric thread and a cover. Wound balls generally are more difficult and expensive to manufacture than solid golf balls. Solid golf balls include one-piece constructions, two-piece constructions comprised of an elastomeric-based core and a cover, and three-piece and multi-layer balls which typically have an elastomeric-based core, at least one intermediate layer, and a cover. The elastomer-based cores typically represent the greatest volume within the golf ball. One-piece balls are the simplest and least expensive to manufacture but do not offer the desired playing characteristics. Their performance typically relegates them to use as range balls. The two-piece construction offers improved playing characteristics while being relatively easy to manufacture.

[0005] The solid golf balls or cores of wound balls generally have an elastomeric-based core that is formed by compression molding with subsequent vulcanization. In the case of a one-piece ball, the entire ball is constructed by this process. Polybutadiene of 90% or greater cis-content is generally preferred for golf balls possessing the best balance between feel and distance. The polybutadiene polymer is generally formulated with a free radical coagent and a free radical source. The free radical coagent is most often a metal salt of an α,β -ethylenically unsaturated carboxylic acid. The free radical source is predominantly a peroxide or combinations of peroxides. The free radical coagent is believed to both homopolymerize as well as graft to the polybutadiene

during the crosslinking reaction. During this process, a high modulus filler is created in situ with connection to the elastomeric matrix. The result is a compound with sufficient rigidity, resiliency, and durability for golf ball play.

[0006] U.S. Pat. No. 4,056,269 and U.S. Pat. No. 4,264,075 disclosed a molded golf ball employing a filler-functioning cross-linking monomer comprising a polyvalent metal salt of an unsaturated acid. At sufficient levels of filler-functioning cross-linking monomer, the golf ball composition comprising cis-polybutadiene elastomer was reported to have good properties. However, it was also reported that the curing process generated an exotherm during the vulcanization step. The exotherm was reported to exceed the temperature of the mold by 60° C. This resulted in an internal temperature of 220° C.

[0007] The exotherm reported on curing the golf ball core composition is likely due to the expected exotherm that would be seen from the free radical initiated homopolymerization of the coagent in such a viscous medium as polybutadiene elastomer. As the internal temperature of the compound increases, the rate of decomposition of peroxide to free radicals also increases. Once decomposed, the oxygen-centered radical from the peroxide has the ability to both abstract a hydrogen radical from the polybutadiene or add to the double bond which is typically present in common peroxide coagents. As the flux of radicals in the system increases, the homopolymerization and grafting reactions also increase. This situation whereby the temperature increases the rate of an exothermic reaction which in turn continues to raise the temperature is classically termed a "runaway". It is speculated here that during this runaway time frame, the extent of cure experiences an asymptotic increase. The difficulty lies in the fact that to reach a necessary degree of crosslinking there needs to be a sufficient amount of polymerizable coagent as reported in U.S. Pat. No. 4,056,269 and U.S. Pat. No. 4,264,075. However, it was also reported that the exotherm generated during the curing step made the molding process more difficult. If a golf ball core is formulated with a lower level of polymerizable coagent, the resiliency and durability of the ball are compromised. However, the degree of exotherm found during the cure is less and the time for complete conversion of the peroxide is conversely much longer. By formulating a golf ball core with a sufficient amount of polymerizable coagent for reasonable golf ball performance, an exotherm is created which is sufficient to induce further decomposition of peroxide. The increase in decomposition of peroxide introduces more radicals and an increase in the homopolymerization and grafting reactions. The ability to control the exotherm by cooling is limited by the dimensions of the ball, which offer very little surface area to volume. The result is a rapid increase in crosslink density that may be above that necessary for reasonable golf ball play.

[0008] There have been several citations in the patent literature which disclose the addition of a chemical agent to augment the properties of a golf ball. The augmentation has typically involved a decrease in compression.

[0009] U.S. Pat. No. 4,852,884 discloses a golf ball which exhibits a high coefficient of restitution when a metallic dithiocarbamate is used at levels between 0.1 and 0.5 parts by weight based on 100 parts of a polybutadiene elastomer or mixtures thereof. No disclosure is made as to the mechanism of improvement from the dithiocarbamate.

[0010] U.S. Pat. No. 4,650,193 discloses the creation of a soft layer underneath the golf ball cover. This is accomplished by modifying the cure at the surface of a golf ball during the molding process. The modification occurs by exposing the surface to an agent that alters the cure. The only example and claim to a suitable agent is elemental powdered sulfur.

[0011] U.S. Pat. No. 5,252,652 first discloses the use of an organic sulfur compound and/or a metal salt thereof. The addition of said organic sulfur compound and/or a metal salt thereof to the rubber golf ball core composition produced a rubbery elastomer having improved rebound resiliency after vulcanized. As a golf ball, the result produced by the compound is cited as an increase in initial velocity upon hitting and improved flying performance. No disclosure is made as to the mechanism of improvement from the organic sulfur compound and/or metal salt thereof.

[0012] U.S. Pat. No. 6,184,301 discloses the use of a sulfur halide to impart a solid golf ball with a good degree of both deformation and resiliency. In the final golf ball, the results translate into improved flight distance while maintaining a good feel. No disclosure is made as to the mechanism of improvement from the sulfur halide.

[0013] U.S. Pat. No. 6,666,780 and U.S. Pat. No. 6,679,791 disclose the design of a multi-piece golf ball whereby there exists an optimized hardness profile in which the hardness gradually increases radially outward from the center toward the outside edge or surface of the core. This construction feature is said to provide improved rebound energy, travel distance, durability, and feel of the ball. The patents offer suitable compounding ingredients such as a thiophenol, thionaphthol, halogenated thiophenol or metal salt thereof in order to obtain said hardness gradient. No disclosure is made in either patent as to the mechanism of improvement from the suggested suitable compounding ingredients.

[0014] U.S. Pat. No. 6,162,135 and U.S. Pat. No. 6,291,592 disclose the use of a cis-to-trans catalyst to produce golf balls with lower compression and increased resiliency. The cis-to-trans catalyst will isomerize a portion of the cis-polybutadiene to the trans-configuration yielding a greater trans-polybutadiene content after curing than was originally present. The cis-to-trans catalyst can be applied to the center, intermediate layer, or both, depending on the golf ball construction. The lower modulus and increased resiliency is explained, without being bound to this particular theory, by the increased mobility of the polymer backbones as a result of the combination of cis- and trans-polybutadiene.

[0015] U.S. Pat. No. 6,635,716 discloses the use of a halogenated organosulfur compound or metal salt thereof to increase the coefficient of restitution ("COR") and/or decrease compression. The halogenated organosulfur compound is introduced at levels between 2.2 and 5.0 parts per hundred polybutadiene. No description is given as to the mechanism by which the halogenated organosulfur compound improves COR or decreases compression.

[0016] U.S. Pat. No. 5,697,856 and U.S. Pat. No. 6,287,218 discloses the use of an organosulfur compound in combination with polybutadiene rubber of 90% or greater cis content to affect an increase in the trans-polybutadiene content upon curing to between 10% and 30% for the first

patent and 10% to 50% for the second. The presence of the organosulfur compound is reported to generate a gradient in crosslinking from the center of the core to the exterior. The resultant golf ball has a lower compression while maintaining or increasing resiliency.

[0017] U.S. Pat. No. 5,711,723 and U.S. Pat. No. 5,776,012 disclose the construction of a three-piece golf ball wherein the core and shell regions have different hardness. The difference in hardness between core and shell is brought about by the placement of a crosslinking adjuster in the core composition. The construction is reported to provide improved flight distance and feel. The benefit of the organosulfur compound and metal-containing organosulfur compound is said to be a result of the accelerated mastication of the rubber, and the resulting enhancement of the rebound performance of the soft part of the core.

[0018] U.S. Pat. No. 5,919,101 discloses a three-piece golf ball wherein the core of the golf ball employs an organic sulfide compound. The invention is described to provide a golf ball with good shot feel while maintaining excellent flight performance and durability.

[0019] In all of the cited prior art, with each invention there is the addition of a chemical agent that yields improved golf ball performance. In many of the citations here, the chemical radicals in unsaturated polymers may either cause an increase in crosslink density or cause the polymer to undergo chain scission. The tendency for either of the reactions and the degree to which they occur is dependent upon the chemical nature of the polymer in question. Radical traps are those reagents that react with radicals in a way that generally creates a covalent bond and eliminates the radical character. An example of a common commercial radical trap is an antioxidant. It is well known in the stabilization of unsaturated polymers that peroxides may form along the backbone of the polymer chain. Upon the decomposition of the peroxide, an oxygen-centered radical is generated. The antioxidant, typically having the chemical moieties of amine, sulfur, etc. eliminates the radical nature of the peroxide fragment by either addition of a segment from its composition or by whole addition to the oxygen-centered radical. The action of the antioxidant to trap the newly formed radical may occur prior to the radical being transferred to the polymer or subsequent to the transfer.

[0020] The prior art is void of detail with regard to the mechanism by which the chemical agents described therein impart improved golf ball performance. However, a theory regarding such a mechanism is advanced therein and is used to expand the nature and scope of chemical agents that can be employed. By utilizing the principles delineated herein better golf balls can be manufactured using chemical agents that are typically less costly and more readily accepted in commercial applications.

SUMMARY OF THE INVENTION

[0021] This invention is based upon the determination that the mechanism by which the cure of golf ball cores is optimally altered is one whereby the chemical agent used permits the peroxide to decompose and transfer the radical to the polymer by either addition or abstraction. The chemical agents do not interfere with this crosslinking initiation step. Once the radical is transferred and exists as a carbon-centered radical, the chemical agent disrupts the cure by

either mitigating the homopolymerization reaction of the crosslinking coagent or the cross-over polymerization within the unsaturated core polymer, or both. The prior art that has been previously reviewed herein identifies a number of chemical agents that are believed to perform in this way.

[0022] General classifications of the type of chemical agents that may be used to disrupt the radical cure include free radical polymerization inhibitors or retarders, stable free radicals, peptizing agents, and spin traps. More specifically, the chemical agents in these categories should not have a moiety that can be abstracted by an oxygen-centered radical, thereby terminating the crosslinking reaction prematurely. Generically in order to offer a composition which is lower in compression while maintaining or improving coefficient of restitution.

[0023] The reference Tudos, F.; Foldes-Berezsnich, T. *Free Radical Polymerization* identifies polymerization inhibitors and retarders according to families of chemistry. These are chemical species that react with free radicals to either quench the radical character of the species or reduce its rate of propagation. Those families that were identified include: vinyl monomers, aromatic hydrocarbons, quinones, aromatic nitro compounds, nitroso compounds and nitrones, and aromatic amines.

[0024] The invention relates to the use of a carbon-centered radical trap in a golf ball formulation which includes an amount of polybutadiene, a free radical source, and a crosslinking coagent, such that the reaction product of the formulation has a lower extent of cure than would be present without said agent to trap carbon-centered radicals. This reduction in cure translates into reduced compression and a softer feel from the finished ball. Concurrently, the resiliency and flight distance of the compound may be increased or decreased by the presence of the carbon-centered radical trap.

[0025] Accordingly, the present invention describes solid golf balls which include a core and a resin cover. The solid golf ball design can include a core obtained by one piece molding or be of a multi-piece design where one or more layers are coated onto the core. In any case, such solid golf balls of this invention include a resilient portion obtained by vulcanizing an elastomeric rubber containing composition, which also includes a co-crosslinking agent, a free radical initiator, and a carbon-centered radical trap.

[0026] This invention more specifically discloses a golf ball which is comprised of a solid core and a resin cover wherein the core is produced by curing a composition comprising an elastomeric polymer, a free radical initiator, a radical crosslinking agent, and at least one carbon-centered radical trap, wherein the carbon-centered radical trap is free of sulfur, and wherein the carbon-centered radical trap is not a stable free radical.

[0027] The present invention also reveals a process for manufacturing a golf ball core which comprises (1) blending a mixture of an elastomeric polymer, a free radical initiator, a radical crosslinking agent, and at least one carbon-centered radical trap to produce a golf ball core composition, wherein the carbon-centered radical trap is free of sulfur, and wherein the carbon-centered radical trap is not a stable free radical, (2) compressing the golf ball core composition into an essentially spherical shape to produce an uncured golf ball

core and (3) heating the uncured golf ball core at an elevated temperature to produce a cured golf ball core.

DETAILED DESCRIPTION OF THE INVENTION

[0028] The elastomeric core and potential intermediate layers may be constructed with natural rubber and/or synthetic elastomers. Polybutadiene containing at least 80% cis content is preferred. In addition to the cis-1,4-polybutadiene rubber, the resilient portion of the golf ball may also contain additional rubbers, such as styrene-butadiene rubber, natural rubber, synthetic polyisoprene rubber, styrene-isoprene rubber, and the like. The amount of such additional rubbers that can be included in the resilient portion of the golf ball will normally be no more than about 60 phr (parts per 100 parts by weight of rubber), based upon the total amount of rubber included in the resilient portion of the golf ball. Thus, the resilient portion of the golf ball will normally contain from about 40 phr to 100 phr of the cis-1,4-polybutadiene and from 0 phr to about 60 phr of such additional rubbers. It is normally preferred for such additional rubbers to be present in the resilient portion of the golf ball at a level of no more than about 30 phr. It is normally more preferred for such additional rubbers to be present in the resilient portion of the golf ball at a level of no more than about 15 phr.

[0029] The co-crosslinking agent used in the resilient portion of the golf ball will typically be an unsaturated carboxylic acid or a metal salt thereof. For example, the co-crosslinking agent can be acrylic acid, methacrylic acid, zinc acrylate, zinc methacrylate or a mixture thereof. The co-crosslinking agent will typically be present in the rubbery component of the golf ball at a level which is within the range of about 15 phr to about 60 phr. The co-crosslinking agent will typically be present in the resilient portion of the golf ball at a level which is within the range of about 25 phr to about 40 phr.

[0030] The peroxide used in the resilient portion of the golf ball will typically be an organic peroxide, such as dicumyl peroxide, t-butylperoxybenzoate or di-t-butylperoxide. It is normally preferred to use dicumyl peroxide in such golf ball compounds. The peroxide will typically be present in the rubbery component of the golf ball at a level which is within the range of about 0.5 phr to about 3 phr. The peroxide will preferably be present in the rubbery component of the golf ball at a level that is within the range of about 1 phr to about 2.5 phr.

[0031] Solid golf balls generally include a core and a resin cover. The solid golf ball design may include a core obtained by one piece molding or be of a multi-piece design where one or more layers are coated onto the core. In any case, such solid golf balls of this invention include a resilient portion obtained by vulcanizing a cis-1,4-polybutadiene rubber containing composition which also includes a co-crosslinking agent, a peroxide, and a carbon-centered radical disrupter.

[0032] Golf balls normally have a diameter that is within the range of about 41.15 mm to about 42.67 mm. To meet standardized weight requirements, the resilient portion of the golf ball will also typically contain a filler. Some representative examples of fillers that can be used include barium sulfate, zinc oxide, calcium carbonate, silica, and the like. Antidegradants can also be included in the rubbery component of the golf ball to protect it from degradation.

[0033] The rubber compound for the resilient portion of the golf ball can be prepared by mixing the cis-1,4-polybutadiene, the co-crosslinking agent, the peroxide, the optional filler and any other optional materials by conventional mixing techniques, such as by means of a roller or a kneader. The mixing will normally be carried out for about 10 to about 30 minutes, preferably about 15 to about 25 minutes, at a temperature of 50° C. to 140° C., preferably 70° C. to 120° C.

[0034] The solid golf ball can be a one-piece solid golf ball, a two-piece solid golf ball or a multi-piece solid golf ball. The one-piece solid golf ball can be prepared by vulcanizing the rubber compound through one piece molding. The two-piece and multi-piece solid golf balls normally include a solid core which is comprised of the resilient rubbery compound and a resin cover. In the case of multi-piece solid golf balls, the solid core is composed of a center core which is comprised of the resilient rubbery compound and one or more outer layers coated thereon. At least a portion of the solid core is prepared by vulcanizing the rubber composition of the present invention. The vulcanization will be conducted at a temperature which is within the range of about 140° C. to 170° C. for about 20 minutes to about 40 minutes. The resin cover is one typically comprised of an ionomer resin or a mixture of ionomer resins. Suitable ionomer resins are commercially available from the Mitsui Polychemical Company under the trade names Himilan® 1707, Himilan® 1706 and Himilan® 1605.

[0035] For the purposes of explaining the features of this invention, a critical differentiation is made between a carbon-centered radical and an oxygen-centered radical. Most radical traps used in unsaturated rubber-employing industries are of the type to capture either type of radical. These radical traps are typically used to increase the stability of the unsaturated rubber to radical processes that occur from the formation and decomposition of peroxides. Antioxidants are detrimental to a peroxide cure for the same reason they impart greater service stability to a compound—elimination of radical species. An antioxidant present in a peroxide cure system will decrease the activity of the peroxide by reacting with the decomposed radical fragments. Higher levels of peroxide are therefore needed to affect a reasonable cure. Although this satisfies the condition for cure, it may leave the compound deficient in antioxidant for later stability.

[0036] Radical traps that only capture carbon-centered radicals are different from the prospective of peroxide cure. Here, a peroxide included in the formulation has the opportunity to decompose to the peroxy radical and either abstract a hydrogen radical from the polymer or add to the unsaturation. In either case, the radical is now transferred to the polymer and crosslinking has been initiated. Further reaction then proceeds by a carbon-centered radical mechanism. It is not until this time that the carbon-centered radical trap may interfere with the crosslink propagation reaction.

[0037] This invention relates to the use of chemical compounds to trap carbon-centered radicals during the golf ball curing process. The intended end result is a golf ball that has lower compression due to a decrease in crosslink density while retaining sufficient crosslink density to impart durability to the golf ball and either maintain or increase the resiliency of the golf ball. The subject invention more specifically discloses a golf ball which is comprised of a

solid core and a resin cover wherein the core is produced by curing a composition comprising an elastomeric polymer, a free radical initiator, a radical crosslinking agent, and at least one carbon-centered radical trap, wherein the carbon-centered radical trap is free of sulfur, and wherein the carbon-centered radical trap is not a stable free radical. The present invention further discloses a process for manufacturing a golf ball core which comprises (1) blending a mixture of an elastomeric polymer, a free radical initiator, a radical crosslinking agent, and at least one carbon-centered radical trap to produce a golf ball core composition, wherein the carbon-centered radical trap is free of sulfur, and wherein the carbon-centered radical trap is not a stable free radical, (2) compressing the golf ball core composition into an essentially spherical shape to produce an uncured golf ball core and (3) heating the uncured golf ball core at an elevated temperature to produce a cured golf ball core.

[0038] The elastomeric core and potential intermediate layers may be constructed with natural rubber and/or synthetic elastomers. Polybutadiene containing at least 80% cis content is preferred. In addition to the cis-1,4-polybutadiene rubber, the resilient portion of the golf ball may also contain additional rubbers, such as styrene-butadiene rubber, natural rubber, synthetic polyisoprene rubber, styrene-isoprene rubber, and the like. The amount of such additional rubbers that can be included in the resilient portion of the golf ball will normally be no more than about 60 phr (parts per 100 parts by weight of rubber), based upon the total amount of rubber included in the resilient portion of the golf ball. Thus, the resilient portion of the golf ball will normally contain from about 40 phr to 100 phr of the cis-1,4-polybutadiene and from 0 phr to about 60 phr of such additional rubbers. It is normally preferred for such additional rubbers to be present in the resilient portion of the golf ball at a level of no more than about 30 phr. It is normally more preferred for such additional rubbers to be present in the resilient portion of the golf ball at a level of no more than about 15 phr.

[0039] The co-crosslinking agent used in the resilient portion of the golf ball will typically be an unsaturated carboxylic acid or a metal salt thereof. For example, the co-crosslinking agent can be acrylic acid, methacrylic acid, zinc acrylate, zinc methacrylate or a mixture thereof. The co-crosslinking agent will typically be present in the rubbery component of the golf ball at a level which is within the range of about 15 phr to about 60 phr. The co-crosslinking agent will typically be present in the resilient portion of the golf ball at a level which is within the range of about 25 phr to about 40 phr.

[0040] The peroxide used in the resilient portion of the golf ball will typically be an organic peroxide, such as dicumyl peroxide, t-butylperoxybenzoate or di-t-butylperoxide. It is normally preferred to use dicumyl peroxide in such golf ball compounds. The peroxide will typically be present in the rubbery component of the golf ball at a level which is within the range of about 0.5 phr to about 3 phr. The peroxide will preferably be present in the rubbery component of the golf ball at a level that is within the range of about 1 phr to about 2.5 phr.

[0041] Solid golf balls generally include a core and a resin cover. The solid golf ball design may include a core obtained by one piece molding or be of a multi-piece design where one or more layers are coated onto the core. In any case, such

solid golf balls of this invention include a resilient portion obtained by vulcanizing a cis-1,4-polybutadiene rubber containing composition which also includes a co-crosslinking agent, a peroxide, and a carbon-centered radical disruptor.

Carbon-Centered Radical Disruptors:

[0042] Golf balls normally have a diameter that is within the range of about 41.15 mm to about 42.67 mm. To meet standardized weight requirements, the resilient portion of the golf ball will also typically contain a filler. Some representative examples of fillers that can be used include barium sulfate, zinc oxide, calcium carbonate, silica, and the like. Antidegradants can also be included in the rubbery component of the golf ball to protect it from degradation.

[0043] The rubber compound for the resilient portion of the golf ball can be prepared by mixing the cis-1,4-polybutadiene, the co-crosslinking agent, the peroxide, the optional filler and any other optional materials by conventional mixing techniques, such as by means of a roller or a kneader. The mixing will normally be carried out for about 10 to about 30 minutes, preferably about 15 to about 25 minutes, at a temperature which is within the range of 50° C. to 140° C., and which is preferably within the range of 70° C. to 120° C.

[0044] The solid golf ball can be a one-piece solid golf ball, a two-piece solid golf ball or a multi-piece solid golf ball. The one-piece solid golf ball can be prepared by vulcanizing the rubber compound through one piece molding. The two-piece and multi-piece solid golf balls normally include a solid core which is comprised of the resilient rubbery compound and a resin cover. In the case of multi-piece solid golf balls, the solid core is composed of a center core which is comprised of the resilient rubbery compound and one or more outer layers coated thereon. At least a portion of the solid core is prepared by vulcanizing the rubber composition of the present invention. The vulcanization will be conducted at a temperature which is within the range of about 140° C. to 170° C. for about 20 to 40 minutes. The resin cover is one typically comprised of an ionomer resin or a mixture of ionomer resins. Suitable ionomer resins are commercially available from the Mitsui Polychemical Company under the trade names Himilan® 1707, Himilan® 1706 and Himilan® 1605.

[0045] While certain representative embodiments and details have been shown for the purpose of illustrating the subject invention, it will be apparent to those skilled in this art that various changes and modifications can be made therein without departing from the scope of the subject invention.

What is claimed is:

1. A golf ball which is comprised of a solid core and a resin cover wherein the core is produced by curing a composition comprising an elastomeric polymer, a free radical initiator, a radical crosslinking agent, and at least one carbon-centered radical trap, wherein the carbon-centered radical trap is free of sulfur, and wherein the carbon-centered radical trap is not a stable free radical.

2. A golf ball as specified in claim 1, wherein the carbon-centered radical trap is a chemical agent that disrupts the cross-linking.

3. A golf ball as specified in claim 1, wherein the carbon-centered radical trap is present in an amount as to decrease the compression by 15%.

4. A golf ball as specified in claim 1, wherein the carbon-centered radical trap is present in an amount as to decrease the compression by 25%.

5. A golf ball as specified in claim 1, wherein the carbon-centered radical trap is present in an amount as to decrease the compression by 50%.

6. A golf ball as specified in claim 1, wherein the carbon-centered radical trap is a free radical polymerization inhibitor.

7. A golf ball as specified in claim 1, wherein the carbon-centered radical trap is a free radical polymerization retarder.

8. A golf ball as specified in claim 1, wherein the carbon-centered radical trap is a peptizing agent.

9. A golf ball as specified in claim 3 wherein the solid core is further comprised of a co-crosslinking agent and a peroxide.

10. A golf ball as specified in claim 9 wherein the co-crosslinking agent is present at a level which is within the range of about 15 phr to about 60 phr.

11. A golf ball as specified in claim 10 wherein the peroxide is present at a level which is within the range of about 0.5 phr to about 3 phr.

12. A golf ball as specified in claim 10 wherein the peroxide is present at a level which is within the range of about 1 phr to about 2.5 phr.

13. A golf ball as specified in claim 9 wherein the co-crosslinking agent is present at a level which is within the range of about 25 phr to about 40 phr.

14. A golf ball as specified in claim 13 wherein said core is further comprised of a filler.

15. A golf ball as specified in claim 14 wherein said filler is selected from the group consisting of barium sulfate, zinc oxide, calcium carbonate and silica.

16. A process for manufacturing a golf ball core which comprises (1) blending a mixture of an elastomeric polymer, a free radical initiator, a radical crosslinking agent, and at least one carbon-centered radical trap to produce a golf ball core composition, wherein the carbon-centered radical trap is free of sulfur, and wherein the carbon-centered radical trap is not a stable free radical, (2) compressing the golf ball core composition into an essentially spherical shape to produce an uncured golf ball core and (3) heating the uncured golf ball core at an elevated temperature to produce a cured golf ball core.

17. A process as specified in claim 16 which further comprises encapsulating the cured golf ball core with a resin cover.

18. A process as specified in claim 16 wherein the uncured golf ball core is heated to a temperature of no more than 470° C. to produce the cured golf ball core.

19. The golf ball made by the process specified in claim 16.