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GOLF BALL STRUCTURE

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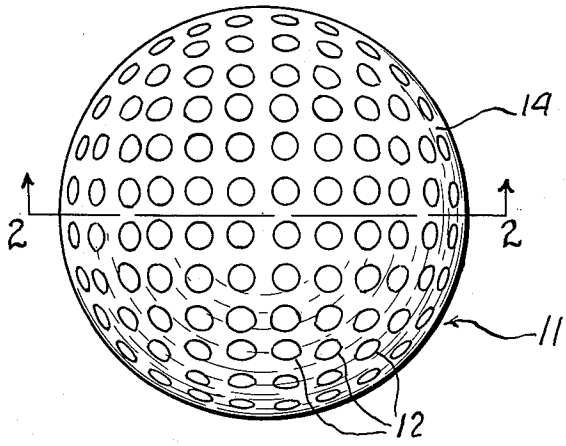



FIG. 1.

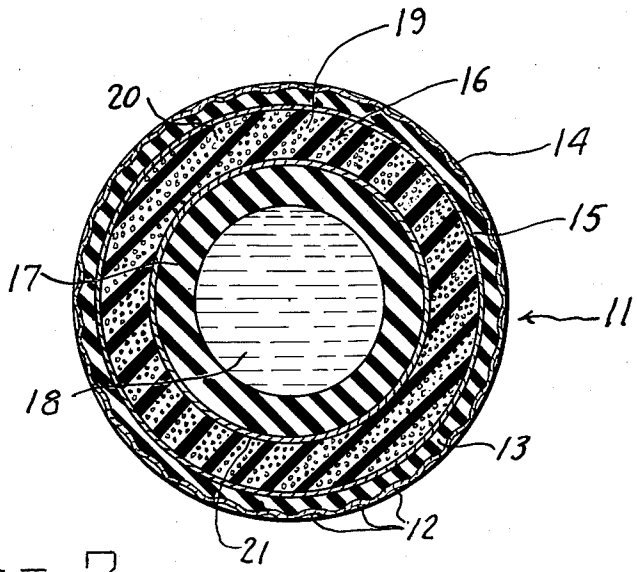



FIG. 2.

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# GOLF BALL STRUCTURE

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This invention relates to a golf ball structure, and, more particularly, to such a structure which is more nearly elastic by virtue of the inclusion therein of a continuous, substantially spherical layer of a metal, which metal layer is bonded or adhered to a resilient portion of the golf ball structure.

It is an object of the instant invention to provide a new golf ball structure.

It is a further object to provide such a structure which is more nearly elastic, and is therefore superior to presently available structures of this type by virtue of the inclusion therein of a thin, continuous, substantially spherical layer of a metal bonded or adhered to a resilient portion of the structure.

Other objects and advantages will be apparent from the description which follows, reference being made to the accompanying drawings, in which—

FIG. 1 is a plan view of a golf ball structure according to the invention; and

FIG. 2 is a vertical sectional view along the line 2—2 of FIG. 1.

Referring now in more detail to the drawings, a golf ball structure according to the invention is indicated generally at 11. As can be seen in FIG. 1, the specific structure shown has the exterior contour of an ordinary golf ball structure, being substantially spherical in shape and having a plurality of dimples 12 arranged in a regular pattern.

As can be seen in FIG. 2, however, the structure 11 includes, adhered to the exterior of a conventional cover 13, usually made of balata gum, a thin metal layer 14. Interior of the cover 13 is a second thin metal layer 15, which second layer is adhered to the exterior surface of a sub-assembly 16, which sub-assembly comprises a resilient hollow core 17 filled with a liquid 18 and an intermediate, resilient layer 19 composed of lengths 20 of a flat, resilient, ribbon-like material wrapped upon the exterior of the core 17. The resilient, liquid-filled core 17, the resilient, intermediate layer 19, and the balata gum cover 13 of the golf ball structure according to the invention are conventionally used in producing golf ball structures, and need not herein be described in detail, as any available core, intermediate resilient layer and cover can be employed in producing a golf ball structure according to the invention. A thin, continuous, substantially spherical metal layer 21 is also provided on the exterior of the liquid-filled resilient core 17.

Each of the thin, continuous, generally spherical metal layers 14, 15 and 21 in the golf ball structure of FIGS. 1 and 2 can conveniently be applied by a vacuum metalizing technique. When the part of the structure on which such a layer is to be applied is of an appropriate chemical composition, the metal layer can be applied directly thereto. When such part of the structure is chemically unsuited to receive a metal layer, such part can be coated with a metallizable film, for example of a suitable synthetic resinous material. Numerous commercially available synthetic resinous materials, particularly various epoxides, are known to be suitable for use in applying coatings, which when hardened, are readily metalizable, and are admirably suited for this purpose, when desired or required.

The following example is presented solely for the purpose of further illustrating and disclosing the invention, and is in no way to be construed as a limitation thereon.



*Example*

A conventional golf ball core which is a substantially spherical, resilient solid body of a styrene-butadiene copolymer rubber filled with a water-glycerin solution is introduced into a chamber evacuated to a pressure of approximately ½ micron of water absolute. Tungsten filaments within the evacuated chamber are then heated electrically to heat, melt, and evaporate or "flash" aluminum clips disposed within the chamber, and the golf ball core is rotated slowly and moved upwardly and downwardly to assure a uniform deposition of the aluminum vapor thereon. Heating of the tungsten filaments is continued until the desired coverage of aluminum is achieved, usually for from about ½ minute to about 2 minutes, and then stopped; evacuation of the chamber is then terminated and a vacuum seal broken. The golf ball core carrying a uniform, continuous, generally spherical coating of aluminum, which coating is approximately 0.000004 inch in thickness, is removed from the chamber.

A flat, or ribbon-like, styrene-butadiene synthetic rubber strip approximately 1/16" wide and 1/64" thick is then wound upon the metalized golf ball core to produce a generally spherical sub-assembly comprising the metalized core (diameter approximately 1") and an adjacent, exterior resilient layer made up of the synthetic rubber strip. The diameter of this sub-assembly is approximately 1½". The sub-assembly is then placed in the evacuated chamber and metalized according to the procedure described above in the preceding paragraph to provide a generally spherical, continuous aluminum coating adhered to the exterior thereof. The aluminum coating, again, is approximately 0.000004 inch in thickness.

A balata gum cover is then assembled over the exterior of the metalized sub-assembly produced as described in the preceding paragraph, and cured, in a conventional manner well known to those skilled in the art. A thin coating of an epoxy resin [1] is then sprayed onto the surface of the cured balata gum cover, and allowed to air dry at an ambient temperature of approximately 25° C. for 24 hours. The assembly after air drying, is then metalized according to the procedure described above to provide a third aluminum coating approximately 0.000004 inch in thickness. After completion of the metalizing, a second coating of the same epoxy resin is sprayed onto the metalized surface and allowed to air dry under ambient conditions of about 25° C. for 24 hours. The resulting product, after the final air drying, constitutes an improved golf ball structure according to the invention.

It will be appreciated from the foregoing example that a preferred structure according to the invention comprises a resilient, substantially spherical core, a layer of a metal having a thickness of the order of about 0.000005 inch (i.e., closer in thickness to 0.000005 inch than to either 0.0000005 inch or 0.00005 inch) adhered to the core, an intermediate resilient layer exterior of the metal coating, the exterior of the intermediate layer being generally spherical in shape, a second, generally spherical, continuous coating of a metal of the order of about 0.000005 inch in thickness adhered to the intermediate resilient

[1] The particular epoxy resin used is produced by condensing approximately equimolecular proportions of bisphenol-A and epichlorohydrin in the presence of sodium hydroxide, washing the resulting reaction product to remove sodium chloride therefrom, drying the resulting washed product, and dissolving the dried reaction product in a mixture of 25 parts by volume of methylisobutyl ketone and 75 parts by volume of toluene to a viscosity desired for spraying. The epoxy resin has an epoxide equivalent of 170. Prior to spraying, the epoxy composition is mixed with 15 parts of tridimethyl amino methyl phenol per 100 parts of resin.

layer, a cover surrounding, and in close proximity to the second metal layer, and a generally spherical, substantially continuous coating of a metal adhered to the cover and having a thickness of the order of about 0.000005 inch. Preferably, there is, intermediate the third metal coating and the cover, a synthetic resinous coating, and, most desirably, the structure includes a synthetic resinous coating intermediate the cover and the third metal layer, and, also, a second synthetic resinous coating exterior of the third metal coating. Epoxy coating compositions are ideal as each of the two synthetic resinous coatings.

It will be apparent that the bright, silvery appearance of the visible aluminum layer in a preferred golf ball structure according to the invention is not only decorative, but also facilitates finding a "lost ball," and that the aluminum can be coated with a colored material, if desired, to give any other desired decorative effect. In such case, the aluminum brightens the appearance of the colored material.

Each of the metal layers or coatings in the golf ball structure produced as described in the foregoing example makes the golf ball approach more nearly an elastic condition when subjected to compression, as during use. It is well known that natural and synthetic rubbers, while they are popularly considered to be "elastic," and are such in the sense that they can be stretched by a tensile force and will, upon release of the tensile force, return to approximately their original condition, approach true elasticity far less closely than do most metals. It is believed, in retrospect, that the improved characteristics of a golf ball structure according to the invention are attributable to an unexpected cooperative effect between each of the generally spherical, thin metal layers therein and the resilient, but relatively poor elastic characteristics of the material to which such layer is adhered, the result of such cooperation being a greater reactive force when a golf ball structure according to the invention is subjected to a given impact. It will be appreciated, therefore, that, while a preferred structure according to the invention includes all three of the disclosed metal layers, it is essential for the cooperative action only that there be one such metal layer, and that the one layer can be exterior of the core, exterior of the winding, or exterior of the cover. While a thickness of the order of about 0.000005 inch has been disclosed as preferred, thicker metal layers, in most cases up to about 0.0005 inch, may also be used.

It will be apparent that various changes and modifications can be made from the specific details set forth herein, without departing from the spirit and scope of the attached claims.

What I claim is:

1. A golf ball structure comprising a generally spherical, resilient core having a generally spherical exterior surface, a continuous layer of aluminum having a thickness of about 0.000005 inch adhered to said exterior surface, an intermediate layer of a resilient material disposed around and in close proximity to said metal layer, said intermediate layer having a generally spherical exterior surface, a second layer of aluminum having a thickness of the order of about 0.000005 inch adhered to the exterior of said intermediate resilient layer, a resilient cover disposed around and in close proximity to said second aluminum layer, a hardened epoxy coating adhered to the exterior surface of said cover, a third aluminum layer having a thickness of about 0.000005 inch adhered to the exterior of said hardened epoxy coating, and a second epoxy coating layer adhered to the exterior of said third aluminum layer.

2. A golf ball structure comprising a generally spherical, resilient core having a generally spherical exterior surface, a continuous layer of a metal having a thickness of about 0.000005 inch adhered to said exterior surface, an intermediate layer of a resilient material disposed around and in close proximity to said metal layer, said intermediate layer having a generally spherical exterior surface, a second layer of a metal having a thickness of the order of about 0.000005 inch adhered to the exterior of said intermediate resilient layer, a resilient cover disposed around and in close proximity to said second metal layer, a hardened epoxy coating adhered to the exterior surface of said cover, a third layer of a metal having a thickness of about 0.000005 inch adhered to the exterior of said hardened epoxy coating, and a second epoxy coating layer adhered to the exterior of said third metal layer.

3. A golf ball structure comprising a generally spherical, resilient core having a generally spherical exterior surface, a continuous layer of a metal having a thickness of about 0.000005 inch adhered to said exterior surface, an intermediate layer of a resilient material disposed around and in close proximity to said metal layer, said intermediate layer having a generally spherical exterior surface, a second layer of a metal having a thickness of the order of about 0.000005 inch adhered to the exterior of said intermediate resilient layer, a resilient cover disposed around and in close proximity to said second metal layer, a hardened synthetic resinous coating adhered to the exterior surface of said cover, a third layer of a metal having a thickness of about 0.000005 inch adhered to the exterior of said hardened resinous coating, and a second synthetic resinous coating layer adhered to the exterior of said third metal layer.

4. A golf ball structure comprising a generally spherical, resilient core having a generally spherical exterior surface, a continuous layer of a metal having a thickness of about 0.000005 inch adhered to said exterior surface, an intermediate layer of a resilient material disposed around and in close proximity to said metal layer, said intermediate layer having a generally spherical exterior surface, and a resilient cover disposed around and in close proximity to said intermediate layer.

5. A golf ball structure comprising a resilient core having a generally spherical exterior surface, an intermediate layer of a resilient material disposed around and in close proximity to said resilient core, said intermediate layer having a generally spherical exterior surface, a resilient cover disposed around and in close proximity to said intermediate layer, and having a generally spherical exterior surface, and layers of a metal having a thickness of about 0.000005 of an inch adhered to at least two of said generally spherical exterior surfaces, both of said metal layers being continuous throughout the entire generally spherical exterior surface to which they are adhered.

6. A golf ball structure comprising a resilient core having a generally spherical exterior surface, an intermediate layer of a resilient material disposed around and in close proximity to said resilient core, said intermediate layer having a generally spherical exterior surface, a resilient cover disposed around and in close proximity to said intermediate layer, and having a generally spherical exterior surface, and layers of a metal having a thickness from 0.000005 inch to 0.0005 inch adhered to at least two of said generally spherical exterior surfaces, each of said metal layers being continuous throughout the entire exterior surface to which it is adhered.

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