A golf club head includes a cushion channel varying in width. The manufacturing method therefor includes the steps of: forming a through hole on a surface of a main body; preparing a carbon-fiber plate formed by carbon-fiber fabrics; providing the cushion channel between an inner periphery of the through hole and an outer periphery of the carbon-fiber plate when assembled, and permitting the cushion channel to form a varied width; filling filler into the varied width of the cushion channel; precision finishing the surface of the main body to thereby produce the final product of the golf club head.
FIG. 1
PRIOR ART
FIG. 2
PRIOR ART
forming a through hole on a surface of a main body of the golf club head

preparing a carbon-fiber plate by carbon-fiber fabrics

providing a cushion channel between an outer periphery of the carbon-fiber plate and an inner periphery of the through hole

filling the cushion channel with filler

precision finishing the main body to thereby produce a final product

FIG. 3
GOLF CLUB HEAD HAVING A CUSHION CHANNEL FORMED WITH A VARIED WIDTH AND MANUFACTURING METHOD THEREFOR

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation-in-part application of U.S. patent Ser. No. 10/423,989, filed on Apr. 28, 2003.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a golf club head having a cushion channel and a manufacturing method therefor. Particularly, the present invention relates to the cushion channel formed between a through hole of a main body of the golf club head and a prepared carbon fiber plate. More particularly, the present invention relates to an elastic colored filler filled in the cushion channel to prevent from the occurrence of wrinkles or deformation on peripheries of the through holes and the carbon fiber plates.

[0004] 2. Description of the Related Art

[0005] A conventional golf club head mainly includes a main body and a striking plate attached thereto, all of which are made of metal or alloy. The main body is integrally formed as a one-piece single member by casting. Alternatively, the main body is constructed from several members consisting of a crown plate, a sole plate and a side plate by welding. As to the striking plate, which is attached to a front surface of the main body by incorporating, welding or embedding. To meet various requirements, manufactures may change the configuration and the structural connection of the main body and the striking plate to lower its center of gravity and also to reduce its total weight. Since the main body is generally made of metal, the center of gravity and the total weight of the main body cannot be effectively and specifically adjusted.

[0006] Another conventional golf club head mainly includes a metal main body formed with an opening at its top portion and regarded as a filling portion. Plurality of prepared carbon-fiber fabrics are piled up to form a carbon fiber plate, and the carbon fiber plate is used to attach to the opening of the main body in place of sealing it. The prepared carbon-fiber fabrics have plasticity before heating and hardening it. Firstly, the main body is placed in a die assembly and an air-inflating bag is used to support the prepared carbon-fiber fabrics on the main body so that the main body can be formed with a carbon fiber portion. Light material of the carbon-fiber portion may cause reduction of weight and thus the center of gravity and the total weight of the main body can be specifically adjusted. By manufacturing such large-size carbon-fiber portion, it has sophisticated the manufacture processes of the prepared carbon-fiber fabrics and prolonged the manufacture time. In manufacture operation of the carbon-fiber plate, it reduces the product quality due to irregular and uncontrollable deformation of the prepared carbon-fiber fabrics in nature. Moreover, a large area of the prepared carbon-fiber fabrics may weaken the entire structural strength of the main body, and it may further make a lower striking sound instead of a sharp striking sound naturally made by a metal golf club head.

[0007] Another conventional golf club head and the manufacturing method therefor are shown as FIGS. 1 and 2. A wood-type golf club head has a main body 10 and a striking plate 11. The main body 10 possesses most of the metal shell thereof but has a plurality of through holes 12 on the crown plate, the sole plate or the side plate. The through holes 12 are provided with stepped portions 121 for fitting with a number of prepared and light carbon-fiber plates 20 (or weighting member 30). Therefore, the main body 10 may not only have a low gravity center, but also a lower weight; the striking sound but also have a short manufacture process and better quality. The main body 10 may change the position of gravity center and entire weight quickly by adjusting the number, size and weight of the through holes 12, the carbon-fiber plates 20 and the weighting member 30. However, when the carbon-fiber plates 20 are closely fitted with the through holes 12, the interface therebetween easily deforms frequently, and wrinkles appear thereon. This influences the appearance and quality of the products of the golf club head. Therefore, it is necessary to implement and improve the conventional golf club head and the manufacturing method therefor.

SUMMARY OF THE INVENTION

[0008] The present invention intends to provide a golf club head having a cushion channel and a manufacturing method therefor. In the present invention, a cushion channel is provided between an inner periphery of a through hole of the golf club head and an outer periphery of a carbon-fiber plate. The cushion channel is provided with a clearance with an appropriate varied width for the absorbing deformation to reduce the wrinkles and the influence thereof on the entire structural strength. Moreover, the cushion channel may also be filled with elastic colored filler to enhance the appearance of the final product in such a way to mitigate and overcome the above problem.

[0009] The primary objective of this invention is to provide a golf club head having a cushion channel and a manufacturing method therefor, wherein the cushion channel is provided between an inner periphery of a through hole of a main body and an outer periphery of a carbon-fiber plate to form a clearance with an appropriate varied width for absorbing deformation to reduce the wrinkles and the influence thereof on the entire structural strength.

[0010] The secondary objective of this invention is to provide the golf club head having the cushion channel and the manufacturing method therefor, wherein the cushion channel is provided between the through holes of the main body and the carbon-fiber plate, and is filled with elastic colored filler to enhance the appearance of the final product.

[0011] The manufacturing method for the golf club head in accordance with an aspect of the present invention comprises the steps of: forming a through hole on a surface of a main body; preparing a carbon-fiber plate formed by carbon-fiber fabrics; providing a cushion channel between an inner periphery of the through hole and an outer periphery of the carbon-fiber plate when assembled, and permitting the cushion channel to form a varied width; filling filler into the varied width of the cushion channel; precision finishing the surface of the main body to thereby produce the final product of the golf club head.

[0012] The golf club head in accordance with an aspect of the present invention includes a main body, a carbon-fiber
plate and a cushion channel. The main body features a through hole and an inner periphery thereof. The carbon-fiber plate provides with an outer periphery correspondingly to the inner periphery of the through hole. When assembled, provided between the inner periphery of the through hole and the outer periphery of the carbon-fiber plate is the cushion channel formed with a varied width.

[0013] In a separate aspect of the present invention, the cushion channel of the golf club head has at least one turning point where the cushion channel is varying in width for the ease of manufacture.

[0014] In a further separate aspect of the present invention, the cushion channel of the golf club head has a relatively greater width at a predetermined position for absorbing the greater deformation of the main body while striking a golf ball.

[0015] In a yet further separate aspect of the present invention, the cushion channel of the golf club head has a relatively greater width at a predetermined position adjacent to or beyond a striking plate according to the design need.

[0016] In a yet further separate aspect of the present invention, the cushion channel of the golf club head is filled with filler for enhancing the appearance of the final product.

[0017] In a yet further separate aspect of the present invention, a plurality of short fingers are provided on the outer periphery of the carbon-fiber plate and extended outwardly to confront with the inner periphery of the through hole so as to form the cushion channel therebetween such that the carbon-fiber plate positioned in the through hole precisely defines the cushion channel.

[0018] In a yet further separate aspect of the present invention, a stepped portion is formed on the inner periphery of the through hole to receive the carbon-fiber plate such that the large-size carbon-fiber plate is adhered to the stepped portion of the through hole for the ease of manufacture.

[0019] Further scope of the applicability of the present invention will become apparent from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

[0020] The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

[0021] FIG. 1 is an exploded perspective view of a conventional golf club head;

[0022] FIG. 2 is a partially exploded, perspective view of a conventional golf club head;

[0023] FIG. 3 is a flow chart of the manufacture method of the golf club head in accordance with the present invention;

[0024] FIG. 4 is a top view of a golf club head having a cushion channel formed with a varied width in accordance with the first embodiment of the present invention;

[0025] FIG. 4A is an enlarged top view, in FIG. 4, of a turning point of the cushion channel of the golf club head in accordance with the first embodiment of the present invention;

[0026] FIG. 5 is a cross sectional view of the golf club head having the cushion channel formed between the through hole of the main body and the carbon-fiber plate in accordance with the first embodiment of the present invention;

[0027] FIG. 6 is a cross sectional view of the cushion channel of the golf club head formed between the through hole of the main body and the carbon-fiber plate in accordance with the first embodiment of the present invention, which shows the elastic colored filler filled in the cushion channel;

[0028] FIG. 7 is a cross sectional view of the golf club head having the cushion channel in accordance with the second embodiment of the present invention;

[0029] FIG. 8 is a top view of a carbon-fiber plate provided with short fingers on the peripheral thereof for use in the golf club head in accordance with the third embodiment of the present invention;

[0030] FIG. 9 is a side view of the carbon-fiber plate and the short fingers for use in the golf club head in accordance with the third embodiment of the present invention.

[0031] FIG. 10 is a top view of the golf club head having the cushion channel formed with the varied width in accordance with the third embodiment of the present invention, wherein the cushion channel is formed by means of the short fingers;

[0032] FIG. 10A is an enlarged top view, in FIG. 10, of a turning point of the cushion channel of the golf club head in accordance with the third embodiment of the present invention;

[0033] FIG. 11 is a top view of another golf club head having the cushion channel formed with the varied width in accordance with the present invention;

[0034] FIG. 11A is an enlarged top view, in FIG. 11, of a turning point of the cushion channel of the golf club head in accordance with the present invention;

[0035] FIG. 12 is a side view, in FIG. 11, of the cushion channel of the golf club head in accordance with the present invention;

[0036] FIG. 12A is an enlarged top view, in FIG. 12, of another turning point of the cushion channel of the golf club head in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0037] Referring to FIGS. 3, 4 and 4A, the first step of the manufacture method in accordance with the first embodiment of the present invention is forming a plurality of through holes 12 on the surface of the main body 10 of the golf club head. The main body 10 is preferably formed as a single one-piece member by casting and the material thereof can be selected from a group consisting of stainless steel, titanium alloy, and iron etc. Generally, a striking plate 11 is attached to the front of the main body 10 by welding,
integrated forming or embedding. An appropriate amount of the through holes 12 are formed on the crown plate, the sole plate or the side plate of the main body 10. A stepped portion 121 is formed on the peripheral of the through holes 12 for supporting a carbon-fiber plate 20, a weighting member 30 and a nameplate 40 (as shown in FIG. 1), which are constructed from predetermined sizes, in the following procedure.

[0038] Referring to FIGS. 3, 4 and 4A, the second step of the manufacture method in accordance with the first embodiment in the present invention is prefabricating a plurality of the carbon-fiber plate 20 by means of carbon-fiber fabrics for hastening the following procedure and promoting the quality of the golf club head product. The present invention utilizes plural layers of plastic carbon-fiber fabrics cross-stocked in a press block (not shown) which may press the carbon-fiber fabrics. In a heating process, the pressed carbon-fiber fabrics are hardened to produce the carbon-fiber plates 20 having a predetermined size. Preferably, 4 to 10 layers of carbon-fiber fabrics are arranged in the cross-stocked angle of zero degrees, 90 degrees or ±45 degrees and heating at 130° C. for 20 minutes. In the first embodiment of the present invention, some sections of the outer periphery of the carbon-fiber plate 20 have curvatures approximately equal to those of the inner periphery of the through hole 12.

Therefore, the periphery of the carbon-fiber plate 20 and the through hole 12 can be milled to thereby form a clearance in the following process.

[0039] Moreover, as shown in FIGS. 4, 4A and 11 through 12, the amount, size and weight of the through hole 12, carbon-fiber plate 20 and weight 30 may be changed according to the design choice. Thereby, the position of gravity center and weight of the main body 10 can be specifically adjusted in the invention. Because the main body 10 is made of metal, a sharp sound will be made when striking a golf ball (not shown). In an alternative embodiment, the carbon-fiber plate 20 can be constructed from other non-metal plate with lightweight and high strength, e.g. polymer plastic material and high-strength fiber material.

[0040] Referring to FIGS. 3 through 5, the third step of the manufacture method in accordance with the first embodiment in the present invention is providing a cushion channel (identified as “a”) between the outer periphery of the carbon-fiber plate 20 and the inner periphery of the through hole 12 formed with a varied width. The cushion channel “a” is provided with a clearance with an appropriate varied width for the absorbing deformation to reduce the wrinkles and the influence thereof on the entire structural strength.

[0041] The carbon-fiber plate 20 in the invention is bonded to the corresponding through hole 12 of the main body 10 by means of epoxy resin or the like. Preferably, before or after the bonding, a CNC milling can be used to remove peripheral portions of the material of the carbon-fiber plate 20 and the through hole 12 of the main body 10 so as to form some sections of the cushion channel “a” with a uniform width in addition to the varied width. Therefore, the clearance of is adapted to cushion the effect of a striking stress, thereby reducing the possibility of wrinkles and maintain the strength of the entire main body 10. The cushion channel “a” can also be formed between the weighting member 30, the nameplate 40 and the corresponding through holes 12 by a CNC milling procedure.

[0042] Referring back to FIGS. 4 and 4A, in the illustrated first embodiment, the cushion channel “a” is provided with a varied width by varying one of annular edges of the through hole 12 of the main body 10 and the carbon-fiber plate 20. Preferably, the cushion channel “a” has relatively greater widths disposed at turning points 12a. Alternatively, the cushion channel “a” has relatively greater widths disposed at several positions selected from a front side portion 12b (i.e. adjacent to striking plate 11) and a rear side portion 12c (i.e. beyond striking plate 11).
periphery of the carbon-fiber plate 20 commonly define the cushion channel “a” varying in width when assembled. The cushion channel “a” provides with a clearance for the elastic deformation of the carbon-fiber plate 20 and the through hole 12. Moreover, by referring back to FIG. 4, various elastic colored fillers “b” can be filled in the cushion channel “a” so as to promote the appearance and product price of the main body 10 without affecting the cushion effect.

In an alternative embodiment, when the carbon-fiber plate 20 is adhered to the stepped portion 122 on the through hole 12, the cushion channel “a” is formed on the inner periphery of the through hole 12 by CNC milling the second stepped portion 123, as best shown in FIG. 7. In another embodiment, when the carbon-fiber plate 20 is adhered to the first stepped portion 122 of the through hole 12, the cushion channel “a” is formed on the outer periphery of the carbon-fiber plate 20 by CNC milling.

Furthermore, as shown in FIGS. 11, 11A, 12 and 12A, when the size of the through holes 12 and the carbon-fiber plate 20 is too large to form a predetermined longer distance of the cushion channel “a”, a number of disadvantages limitations exist for a CNC milling process in milling the periphery of the through holes 12 and the carbon plate 20. Alternatively, a first stepped portion 122 and a second stepped portion 123 of the second embodiment in the present invention, as best shown in FIG. 7, can be used to position the large-size carbon-fiber plate 20 on the large-size through holes 12 so as to form a desired, predetermined longer distance of the cushion channel “a” varying in width.

Advantageously, the stepped portion 122 of the through hole 12 conveniently receives the carbon-fiber plate 20 such that the large-size carbon-fiber plate 20 is adhered to the first stepped portion 122 of the through hole 12 for the ease of manufacture. Meanwhile, the second stepped portion 123 of the through hole 12 precisely defines the cushion channel “a” varying in width.

Turning now to FIGS. 8 through 10A, reference numerals of the third embodiment of the present invention have applied the identical numerals of the first embodiment, as shown in FIG. 4. The construction of the golf club head structure in accordance with the third embodiment of the present invention has similar configuration and same function as that of the golf club head structure of the first embodiment and detailed descriptions may be omitted.

Referring to FIGS. 3, 4 and 8 through 10A, the golf club head having the cushion channel in accordance with the third embodiment of the present invention is disclosed. As compared with the first and second embodiments, the third step of the manufacture method in the third embodiment is provided with plural short fingers 21 on the outer periphery of the carbon-fiber plate 20 to maintain a perfect assembled relationship of the cushion channel “a”. The size of the outer periphery of the carbon-fiber plate 20 in the illustrated third embodiment is slightly smaller than that of the inner periphery of the through hole 12. When the carbon-fiber plate 20 is bonded on the stepped portion 121, the short fingers 21 on the carbon-fiber plate 20 extend outwardly to confront with the inner periphery of the through hole 12 to form a cushion channel “a” and a clearance therebetween for cushioning the striking stress. As shown in FIG. 9, the short fingers 21 can be integrally formed with the carbon-fiber plate 20 by processing a CNC milling procedure on a large-size outer periphery of the carbon-fiber plate 20 so as to form a plurality of outwardly extended fingers. The thickness of each of the short fingers 21 is preferably thinner than that of the outer periphery of the carbon-fiber plate 20 to thereby avoid the short fingers 21 sticking out of the filler “b” from the cushion channel “a”.

Advantageously, the short fingers 21 of the carbon-fiber plate 20 can provide the cushion channel “a” formed between the inner periphery of the through hole 12 and the outer periphery of the carbon-fiber plate 20 such that the carbon-fiber plate 20 positioned in the through hole 12 precisely defines the cushion channel “a” varying in width.

As shown in FIGS. 11, 11A, 12 and 12A, the short fingers 21 of the carbon-fiber plate 20 in the third embodiment can also be adapted to support a large-size carbon-fiber plate 20 on a large-size through hole 12 for forming cushion channel “a” with various widths.

As has been described above, the conventional carbon-fiber plate 20 is closely fitted with the through hole 12 on the main body 10, thereby plastic deformation and wrinkles occur constantly, as shown in FIGS. 1 and 2. However, the golf club head and the manufacture method therefor in the present invention indeed maintain the structural strength of the main body 10 and promote the quality and the product price.

Although the invention has been described in detail with reference to its presently preferred embodiment, it will be understood by one of ordinary skill in the art that various modifications can be made without departing from the spirit and the scope of the invention, as set forth in the appended claims.

What is claimed is:

1. A manufacturing method for a golf club head comprising the steps of:
   - forming at least one through hole on a surface of a main body;
   - preparing a carbon-fiber plate formed by carbon-fiber fabrics;
   - providing a cushion channel between an inner periphery of the through hole and an outer periphery of the carbon-fiber plate when assembled, and permitting the cushion channel to vary in widths; and
   - filling filler into the cushion channel.

2. The manufacturing method for the golf club head as defined in claim 1, further comprising the step of: precision finishing the surface of the main body to thereby produce the final product of the golf club head.

3. The welding method for manufacturing the golf club head as defined in claim 1, wherein a stepped portion is formed on the inner periphery of the through hole for adhering to the carbon-fiber plate.

4. The manufacturing method for the golf club head as defined in claim 3, wherein when the carbon-fiber plate is adhered to the stepped portion of the through hole, the cushion channel is formed on the outer periphery of the carbon-fiber plate by CNC milling.

5. The manufacturing method for the golf club head as defined in claim 3, wherein when the carbon-fiber plate is adhered to the stepped portion on the through hole, the
cushion channel is formed on the inner periphery of the through hole by CNC milling.

6. The manufacturing method for the golf club head as defined in claim 1, wherein a first stepped portion and a second stepped portion are formed on the through hole, the first stepped portion is provided for adhering to the carbon-fiber plate; and the cushion channel is formed by the inner periphery of the through hole, the second stepped portion, and the outer periphery of the carbon-fiber plate.

7. The manufacturing method for the golf club head as defined in claim 6, wherein the first stepped portion and the second stepped portion are integrally formed on the through hole of the main body by casting.

8. The manufacturing method for the golf club head as defined in claim 1, wherein a size of the carbon-fiber plate is smaller than that of the through hole, and a plurality of short fingers are provided on the outer periphery of the carbon-fiber plate and extended outwardly to confront with the inner periphery of the through hole so as to form the cushion channel therebetween such that the carbon-fiber plate positioned in the through hole precisely defines the cushion channel.

9. The manufacturing method for the golf club head as defined in claim 8, wherein the short fingers are formed on the outer periphery of a large-size periphery of the carbon-fiber plate by CNC milling.

10. The manufacturing method for the golf club head as defined in claim 1, wherein the filler is selected from an elastic colored material.

11. The manufacturing method for the golf club head as defined in claim 1, wherein the filler is selected from non-metal material.

12. The manufacturing method for the golf club head as defined in claim 1, wherein the carbon-fiber plate can be replaced by another non-metal plate with low weight and high strength.

13. The manufacturing method for the golf club head as defined in claim 1, wherein the cushion channel of the golf club head has at least one turning point where the cushion channel is varying in width.

14. The manufacturing method for the golf club head as defined in claim 1, wherein the cushion channel of the golf club head has a relatively greater width at a predetermined position adjacent to or beyond a striking plate.

15. A golf club head, comprising:
   a main body provided with a striking plate, a crown plate, a sole plate, a side plate;
   the main body is formed with at least one through hole;
   at least one carbon-fiber plate formed by carbon-fiber fabrics, the carbon-fiber plate is adapted to adhere to the through hole;
   a cushion channel formed between an outer periphery of the carbon-fiber plate and an inner periphery of the through holes, said cushion channel varying in width; and
   a filler filled in the cushion channel.

16. The golf club head as defined in claim 15, wherein a stepped portion is formed on the inner periphery of the through hole for adhering to the carbon-fiber plate.

17. The golf club head as defined in claim 15, wherein a first stepped portion and a second stepped portion are formed on the through hole, the first stepped portion is provided for adhering to the carbon-fiber plate; and the cushion channel is formed by the inner periphery of the through hole, the second stepped portion, and the outer periphery of the carbon-fiber plate.

18. The golf club head as defined in claim 15, wherein a plurality of short fingers are provided on the outer periphery of the carbon-fiber plate and extended outwardly to confront with the inner periphery of the through hole.

19. The golf club head as defined in claim 15, wherein the filler is selected from an elastic colored material.

20. The golf club head as defined in claim 15, wherein the filler is selected from non-metal material.

21. The golf club head as defined in claim 15, wherein the cushion channel of the golf club head has at least one turning point where the cushion channel is varying in width.

22. The golf club head as defined in claim 15, wherein the cushion channel of the golf club head has a relatively greater width at a predetermined position adjacent to or beyond the striking plate.

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