

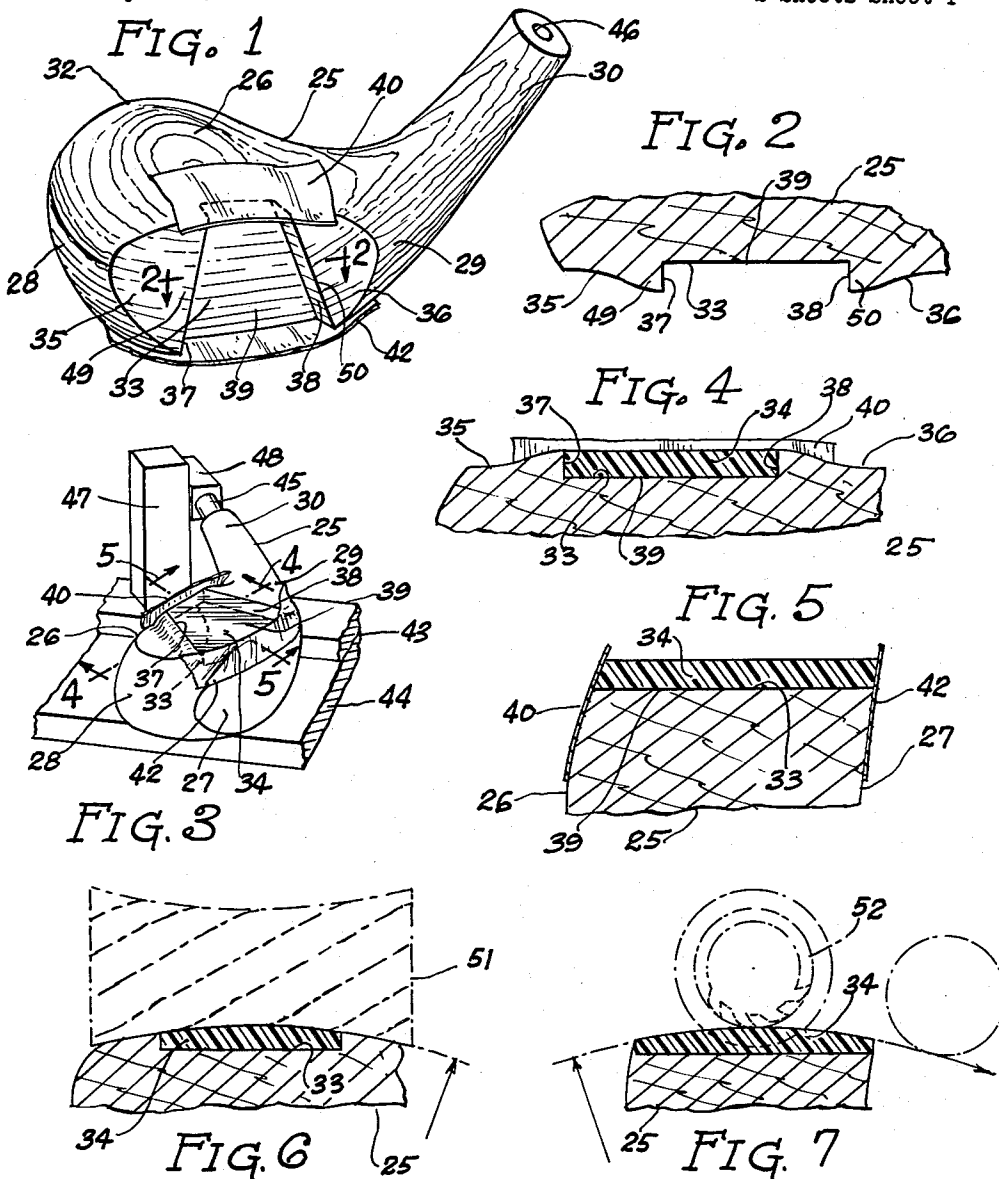
March 9, 1965

C. D. BAKER ET AL
GOLF CLUB HEAD HAVING A PLASTIC STRIKING FACE INSERT
BONDED TO THE CLUB HEAD MATERIAL AND METHOD
FOR MAKING SAME

3,172,667

Filed April 2, 1962

2 Sheets-Sheet 1



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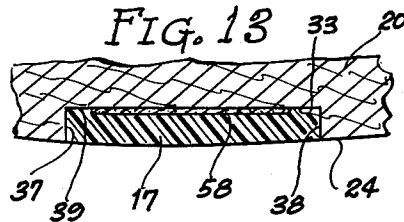
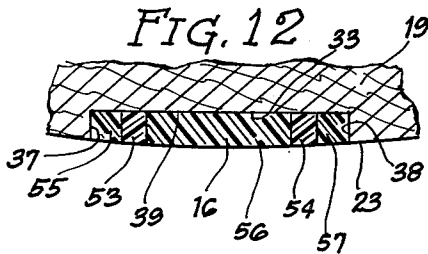
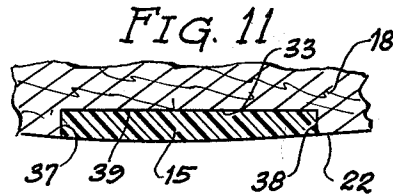
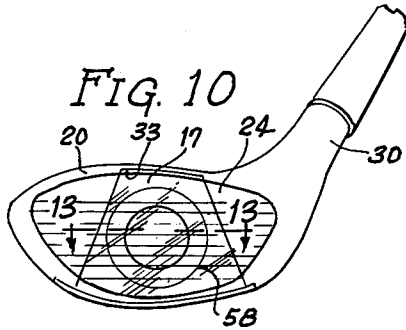
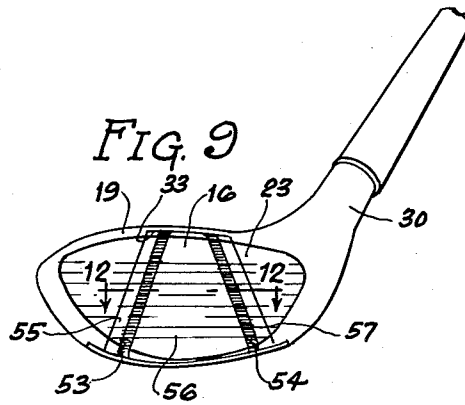
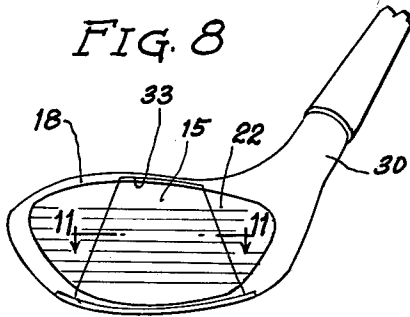
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GOLF CLUB HEAD HAVING A PLASTIC STRIKING FACE INSERT BONDED TO THE CLUB HEAD MATERIAL AND METHOD FOR MAKING SAME

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11 Claims. (Cl. 273-173)

This invention relates to golf club heads and a method of making the same, and more particularly, the invention pertains to the wood-types of golf club heads and a method of producing such heads with a front surface forming insert which is cast in place and becomes an integrated part of the head structure.

In the past it has been customary to provide an insert of a relatively hard and durable material in a recess at the front of a wood-type club head to serve as a ball striking face having substantial area. In most instances, the inserts have been prefabricated and carefully fitted to a recess in the front of a head block. Such prefabricated and fitted inserts were secured in place by an adhesive material, as well as by a plurality of small fastening elements, such as screws. In addition to the considerable amount of skilled labor involved for producing, fitting and mounting the prefabricated and fitted inserts, experience has shown that after extended periods of hard usage or after being subjected to varying conditions of heat or humidity for sufficient periods of time, an appreciable percentage of such fitted inserts are sufficiently loosened that they do not provide the same ball impact and "solid feel" that is present with a tightly secured and well fitted insert. Repair usually requires replacement and refitting of the insert, and this is not a simple and easy matter, inasmuch as even the removal and resetting of the fastening elements tends to change their holding ability.

Attempts have been made to produce face inserts in place by molding accompanied by the application of heat and pressure. In addition to the fact that such a heat and pressure molding method does not produce a particularly strong and durable bond between the molded insert material and the material or wood of the club head, there is some tendency for many heat and pressure molded materials to shrink when they cool after molding and the heat application required for the molding reduces the moisture content of fibrous materials, such as wood, to invoke dimensional changes thereof during and after the heat and pressure molding operation.

One of the general objects of this invention is to provide a structure for, and method of producing wood-type golf club heads having a front face insert cast in place from a material which is initially in liquid form and hardens at normal room temperature and atmospheric pressure without significant shrinkage and which material forms a bond with the other material of the club head that is so intimate and strong that the resultant club head structure is solidly, strongly and firmly integrated in its nature and durable in use.

Another object of this invention is to provide a structure for, and method of producing wood-type golf club heads which results in the substitution of simple production operations by relatively unskilled personnel for the time-consuming and skilled operations required for fitting and mounting prefabricated face inserts by methods commonly in use, and as a result of which the resultant product is superior in both performance and lasting qualities to those previously produced.

This invention has within its purview the provision of

a wood-type golf club head structure of the kind to which reference has been made and which is subject to ease of repair in the event that the face insert of the club head is damaged either through use or misuse.

The invention comprehends the provision of a wood-type golf club head structure and a method of producing such golf club heads which lend themselves readily to a practically unlimited variety of variations of design and decorative possibilities in respect to the face insert of the club head.

It is an object of the invention to provide a wood-type golf club head structure and a method of producing such golf club heads, which structure and method not only effect substantial savings in costs of labor required for applying a front face insert in the head structure, but which are also very economical in respect to the costs of tools, dies and equipment for producing, applying and finishing the front face and its insert.

As another object, the invention comprehends the provision of a wood-type golf club head structure having a front face element cast in place and a method of producing such a structure whereby the hardness of the face element can be preselected within limits to afford desirable impact and wear resistant characteristics.

The invention further has within its purview the provision of a wood-type golf club head structure and a method of making the same which results in a combination that is unaffected in its operational characteristics or durability by a wide range of changes of temperature and humidity.

Other objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a front perspective view of a roughly formed block of fibrous material, such as wood, from which a preferred embodiment of a finished golf club head of this invention can be made and which is illustrative of one step of the preferred method for producing such wood-type golf club heads in accordance with the method of this invention;

FIG. 2 is a fragmentary top sectional view taken substantially as indicated by a line 2-2 and accompanying arrows in FIG. 1;

FIG. 3 is a perspective view of a roughly formed golf club head element of the type shown in FIG. 1 mounted on a supporting fixture in a manner adapted to carrying out a step in the production of wood-type golf club heads of the preferred type by the preferred method, as disclosed herein;

FIGS. 4 and 5 are fragmentary sectional views taken substantially as indicated by lines 4-4 and 5-5 respectively and accompanying arrows in FIG. 3;

FIG. 6 is a fragmentary bottom sectional view of a roughly formed wood-type golf club head structure of the type depicted in FIGS. 1 and 3, and wherein a milling cutter is shown in dot-and-dash lines for illustrating a further step in the preferred method for producing finished golf club heads of the preferred type;

FIG. 7 is an end fragmentary sectional view somewhat similar to FIG. 6, and wherein a second part of the milling operation is depicted and wherein the path of the milling cutter in reference to the front club head surface is controlled to afford desired contours in producing the preferred type of finished golf club head in accordance with the preferred method of this invention;

FIG. 8 is a front elevational view of a finished golf club head of the preferred type and which may be made by the preferred method;

FIGS. 9 and 10 are front elevational views of modified wood-type golf club heads similar to that shown in FIG. 8, but which embody variations of the preferred club

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head structure which are illustrative of variations of the structure which can be accomplished by production of the heads in accordance with the method, as disclosed herein; and

FIGS. 11, 12 and 13 are fragmentary top sectional views taken substantially as indicated by lines 11—11, 12—12 and 13—13 of FIGS. 8, 9 and 10 respectively.

In the exemplary embodiment of this invention which is depicted in the accompanying drawings for illustrative purposes, certain method steps and structural features are illustrated in FIGS. 1 to 7 inclusive which are embodied in the disclosed method for producing wood-type golf club heads of the type shown in FIGS. 8 to 13 inclusive and which include front face elements 15, 16 and 17 (in FIGS. 8, 9 and 10 respectively) of a relatively hard and durable material cast in place in head body portions 18, 19 and 20 respectively and which, in the finished golf club heads, serve to provide a ball striking surface at the front of the head and which, in the preferred structure, form parts of front faces 22, 23 and 24 of the finished golf club heads. In the disclosed structures, the front faces 22, 23 and 24 are contoured to provide substantially arcuate curvatures in transverse planes extending longitudinally and vertically of the front face of the club head and wherein arcs have relatively long radii of curvature emanating from a center located to the rear of the club head and which radii are longer than any dimension of the club head as, for example, nine inches. The maximum forward projection of the front face of the club head is at the mid-region of the front face and at the mid-region of the front face element, in each instance, so that in effect, the front face is contoured to recede both vertically and laterally from a generally central position both longitudinally and vertically of the club head face.

In the production of wood-type golf club heads, it is generally customary to produce a roughly formed body block 25, as shown in FIGS. 1 and 3, which has the general contours of the finished golf club head and which is somewhat larger than the finished club head, so that the roughly formed body block encompasses the various dimensions and contours of the finished head. In its roughly formed state, the body block 25 has a contoured top surface 26, a sole surface 27, a toe end portion 28, a heel end portion 29 and a roughly formed hosel 30 which extends upwardly and outwardly in angular relationship to the heel end portion of the block. As considered herein, the direction from the heel to the toe end of the club and along the hosel is considered to be the longitudinal aspect of the club head. Also, the face of the club head which is to constitute the ball addressing and striking face of the club head is considered to be the front of the club head, while the curved and more massive portion 32 of the club head is considered to be the rear portion thereof. A recess 33 is provided in the longitudinal mid-region of the front portion of the roughly formed body block, which recess is provided for the accommodation of an unfinished or rough cast front face element 34. In the disclosed structure and in accordance with the method herein set forth, the unfinished front face element 34 is cast in place, as will be more fully discussed. At opposite ends of the recess 33, roughly formed front face portions 35 and 36 are provided to establish the position and disposition of the front or ball striking face of the club head which, in the finished product, includes the front face element 34 of a relatively hard and durable material.

In the form herein illustrated, the recess 33 extends from the top surface to the sole surface of the front portion of the club head block and is open at its top and bottom ends, as well as at the front surface of the club head block. At its opposite sides, the recess 33 has end walls 37 and 38 which are angularly disposed with respect to a back wall 39 of the recess. In the disclosed structure, the angle between the back wall 39 of the recess and the respective end walls is substantially 90°, although this angle could be varied to provide a dovetail

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effect or to diverge outwardly. In the structure herein disclosed, a dovetail shape for the recess is not essential for assisting in the securement of the insert in place in the manner of this invention. Also, and although a wide variety of shapes could be used for the recess, the end walls 37 and 38 are disclosed as being relatively straight, and as diverging from the top to the bottom of the club head block in a relatively conventional manner.

Since, in accordance with this invention, the front face element 34 which fills the recess 33 and defines the ball striking face of the finished club head is cast in place from a material which is in liquid form at the time of filling the recess therewith, and which material cures or solidifies to a hardened solid state at room temperature and at normal atmospheric pressure, one relatively simple manner of confining the material at the top and bottom ends of the recess 33 in the club head block is to cover the ends of the recess to a level at least equal to that of the end surfaces 37 and 38 with pieces 40 and 42 of material, such as paper, having thereon a coating of a pressure sensitive adhesive which holds the paper pieces in place relative to the top and sole surfaces of the club head block. These paper pieces determine the shape of the cast material at the top and bottom ends of the club head block, so that the insert can be finished and finally shaped along with the club head block after the cast material has solidified. For holding the club head block in position for receiving the insert material in its liquid form and for retaining that position until after the cast material has solidified, a fixture 43 is utilized which, in the disclosed form, has a base 44 which may be placed on any suitable supporting structure. The hosel of the club head block is supported by a pin 45 that fits snugly into a shaft opening 46 therein, and which pin is supported from the base 44 by an upright post 47 which carries a swivel block 48. The swivel block may be rotated in a vertical plane with reference to the upright post 47 and has sufficient resistance to such rotation to support the club head in an established level position. The club head block may also be rotated relative to the pin 45 to a position in which the end surfaces 37 and 38 of the recess 33 are substantially level, so that the liquid material will assume a position flush with the outer edges of the end surfaces 37 and 38 of the recess when poured into the recess in liquid form. After the insert material has solidified, the pieces 40 and 42 which are held in place by pressure sensitive material can be readily removed.

When made in the manner described, it may be understood that the depth of the end surfaces 37 and 38 of the recess 33 determines the maximum thickness of the insert material which can be cast in place in the recess. Inasmuch as the front face of the finished club head is to be spherical in contour with a maximum depth at the mid-region of the front face element, and in order to provide material which can be removed for effecting the desired final contour, it is necessary to provide portions 49 and 50 on the front of the club head block which project forwardly from the intended finished surface contour in an amount for establishing the desired maximum depth of the recess at the mid-region thereof. Thus, before the recess is defined, as by cutting material from the front portion of the club head block, a forwardly projecting plateau area is provided on the block, and the recess is cut at the longitudinal mid-region of this forwardly projecting plateau area.

After the front face element has been cast in place and after the material thereof has cured to a solid state, the final surface contours of the front face portions 35 and 36 and of the front face element 34 may be established and determined by milling the front face area by milling operations, as illustrated in FIGS. 6 and 7. In the method illustrated, a milling cutter 51, shown in FIG. 6, is contoured to provide the desired arcuate curvature longitudinally of the front face of the club head block, while the club head block is swung arcuately in reference to a mill-

ing cutter 52 for establishing the curvature of the finished front face from the top to the bottom thereof. These milling operations may, if desired, be accomplished at the same time by a single contoured milling cutter and by cam guiding the relative motions of the cutter and head.

As a material having the hardness and wear resistant characteristics desirable for the purpose and which will bond itself securely in position in the recess 33 of the club head block and which can also be cast in place in an initial liquid state from which it will cure to solid form at normal room temperature and normal atmospheric pressure, it has been found that a synthetic resin of the epoxy or polyester type is well suited to the purpose. Such materials are available which, in their hardened state, are relatively opaque and have any selected one of a wide variety of colors, as well as in forms which produce a clear, transparent and relatively colorless face element. As a specific example of a material suited to the production of a relatively opaque face element in any one of a wide variety of colors, an epoxy resin known as "Epoweld" is supplied by the H. V. Hardman Co., Inc. of 571 Cortlandt Street, Belleville, New Jersey, known as their Formula No. 3243A. To effect the curing or hardening of the aforementioned "Epoweld" Formula No. 3243A, it is mixed with a second "Epoweld" compound No. 3243B supplied by the same company in substantially the proportions of 100 parts by weight of Formula No. 3243A to 72 parts by weight of compound No. 3243B. After being mixed together, the resultant material remains liquid for casting purposes and then hardens to a solid state. When completely cured at normal room temperature and at normal atmospheric pressure for a period of a few hours, the resultant hardened face element has a Rockwell hardness of approximately R106 to R110. By varying the proportions of the two components which are mixed together just prior to the casting of the face element in a liquid form, the resultant hardness of the face element can be varied, but the aforementioned proportions and hardness have been found very satisfactory for use in connection with the wood-type golf club heads disclosed herein.

As a second specific example, and particularly when a clear, transparent and relatively colorless face element is desired, a polyamide resin known as "Versamid #125" is available from General Mills, Inc., Chemical Division, Post Office Box 191, Kankakee, Illinois. With the "Versamid #125" a component known as "Epon #815" is utilized, which "Epon #815" is available from Shell Chemical Corp., 624 South Michigan Boulevard, Chicago 5, Illinois. For satisfactory results in the adaptation to the structure disclosed herein, equal parts by weight of the "Versamid #125" and the "Epon #815" are mixed together. As in the previously mentioned example, variation of the quantities of the two components which are mixed varies the hardness of the resultant face element. In this instance, the "Versamid #125" is the softer component and the "Epon #815" is the harder component, so that an increase of the "Epon #815" increases the hardness of the resultant face element.

In the form depicted in FIGS. 8 and 11, the finished front face element of the club head constitutes a unitarily cast and relatively homogeneous structure which may be either transparent or which may have any selected one of a wide variety of colors. In the form illustrated in FIGS. 9 and 12, decorative blocks 53 and 54 of a desired color and shape and made of a material, such as nylon, are preformed and placed in the recess 33 of the club head block prior to the casting of the self-hardening plastic material in the recess. In this instance, the decorative blocks 53 and 54 are usually of a color which contrasts with that of the self-hardening plastic material, and one or more such blocks may be utilized to form a wide variety of patterns or designs in the front face element of the club head. Also, it may be observed that the self-hardening plastic

material is cast into the recess between and on opposite sides of the blocks to provide portions 55, 56 and 57 of the self-hardening plastic material which bond themselves adhesively to both the club head block and the inserted blocks securely to anchor and hold the decorative insert blocks in place in the finished front face element.

The form of the structure depicted in FIGS. 10 and 13 lends itself particularly to the use of a transparent and relatively colorless self-hardening plastic material for the front face element. In this instance, a decorative insert 58, such as a metal plate carrying a design placed thereon in suitably colored enamel, is placed in the recess 33 of the club head block prior to the casting of the material which constitutes the finished front face element 17. The self-hardening plastic material, in this instance, covers the decorative insert and the self-hardening plastic material bonds itself thereto, as well as to the club head block to secure both the decorative insert and the front face element in place, while affording a finished insert of the desired finished contours, as well as providing a structure through which the decorative insert is clearly visible. An extremely wide variety of various combinations and variations of the illustrative examples of insert elements is feasible and practical, within the scope of this invention.

It is particularly noteworthy with respect to the structure and method herein disclosed that the club head body block 25 is made of a fibrous material, such as wood. By utilizing therewith the self-hardening plastic materials disclosed herein, the initially cast plastic material which is in liquid form wets the fibers of the block and very intimately intermingles therewith, so that when the material of the front face element hardens, an extremely strong bond develops for securely holding the insert in place in the club head during and after the finishing operations, and during subsequent use. As a matter of fact, the bond formed between the front face element and the material of the block is so intimate and strong that it is as strong or stronger than either of the materials separately, and the materials mutually reinforce one another. It may also be observed that the shrinkage of the cast material, if any, is so negligible that there is no sign of separation which develops under conditions of use or under conditions of varying temperatures and humidity. Furthermore, inasmuch as the casting operation does not require the application of heat or pressure, and takes place at normal room temperature and normal atmospheric pressure, the material of the body block remains at its stable and normal condition and is unaffected during the casting process. Subsequent to the casting and hardening of the front face element in the body block, the operations utilized for finishing the club head structure and applying a suitable shaft thereto are substantially the same as those commonly used and known in connection with the production of other presently known and used types of club heads.

From the foregoing description and by reference to the accompanying drawings, it may be readily understood that there has been provided a wood-type golf club head structure and a method of producing such wood-type golf club heads which results in a finished club head structure of extreme durability and which has eminently satisfactory ball striking characteristics, because of the secure anchorage of the front face element with reference to the fibrous material of the club head block, as well as due to the hardness, wear resistance and impact characteristics of the material. It may be further understood that the disclosed structure, when produced in accordance with the described method, minimizes the skilled labor required for fitting and securing in place the front face element of the club head. It may also be observed that in the event the club head insert is damaged by abnormal use or as a result of abnormal circumstances, the front face insert can be readily repaired without the removal of all

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of the material of the front face element from the damaged club head, but rather by casting additional material over that previously used, and then finishing the surface of the repaired insert. The added material bonds itself so completely and so firmly to the initially cast material that an integral structure results.

Having thus described the invention, what is claimed is:

1. The method of producing a wood-type golf club head having a ball striking face element cast in place, which method comprises the steps of initially shaping a block of fibrous material to a configuration encompassing that of a finished wood-type golf club head having top and sole surfaces and a front ball striking face and wherein the block includes integral solid material at the front portion thereof which is subject to removal for defining the finished ball striking face, providing a recess in the block which opens outwardly thereof through the mid-region of the front portion and which is open at the top and sole portions of the block, temporarily closing the ends of the recess in substantially flush relationship to the top and sole surfaces of the block and to a position substantially flush with the front surface of the block by means affording ready separability from materials contacted thereby, supporting the block with the recess and front surface in a practically horizontal position and facing upwardly, filling the recess with a self-hardening plastic material in liquid form which wets and bonds itself to the fibrous material of said block and which has no material shrinkage during or after hardening, allowing the self-hardening material to set to a solid state while the block is supported and while the ends of the recess are temporarily closed by said means, and then removing material from the surfaces of the block and solid plastic material to define the finished contours and dimensions of the club head.

2. A wood-type golf club head comprising, in combination, a contoured body of fibrous material having heel and toe ends, a hosel at the heel end, top and sole surfaces and front surface defining portions extending longitudinally of the body at the heel and toe ends thereof and between the sole and top surfaces thereof, said body having therein a recess which extends across the longitudinal mid-region thereof between said front surface defining portions and from the sole surface to the top surface, said recess having opposed end walls which are substantially parallel to one another in a direction from the front to the back of the club head, a generally flat back wall surface between said end walls and upper and lower ends which open through the sole and top surfaces, said recess being filled with a self-hardening plastic material in solid form which has been cast in place in said recess at normal room temperature and at normal atmospheric pressure and which has wet and intimately bonded itself to the fibrous material of said body without appreciable shrinkage upon being cast in place, and said front surface defining portions of the body and the solid plastic material together providing a front surface on the club head which is smoothly curved in transverse planes substantially to constitute arcs having radii larger than the club head and disposed to provide maximum depth of the solid plastic material at the longitudinal and vertical mid-regions of said recess.

3. A wood-type golf club head as defined in claim 2, and wherein said self-hardening plastic material is an epoxy resin which, when hardened, has a Rockwell hardness of between R106 and R110.

4. As an article of manufacture adapted to use in the production of a wood-type golf club head, the combination comprising a rough-cut body block of fibrous material having a configuration conformed generally to and encompassing the contours and dimensions of a finished wood-type golf club head, said rough-cut body block having heel and toe end regions, rough-cut top and sole surfaces and rough-cut front surface defining regions at the heel and toe end regions of the block and extending be-

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tween said top and sole surfaces, said block also having therein a recess between said front surface defining regions, said recess having a back surface and end surfaces of predetermined depth angularly related to the back surface thereof, said recess having therein adhesive plastic material which has been cast in place as a liquid and which has wet the fibers of the block and hardened without appreciable shrinkage relative to said block by curing at normal room temperature and atmospheric pressure.

5. The combination as defined in claim 4, and wherein said adhesive plastic material is an epoxy resin having two combined components mixed in the approximate proportions of equal parts by weight of each component.

6. The combination as defined in claim 4, and further characterized by an insert of a relatively hard material disposed in said recess and secured in place by said adhesive plastic material.

7. The combination as defined in claim 4, and wherein said adhesive plastic material is an epoxy resin having two combined components, one of which produces a harder insert than the other, and which are mixed in approximate proportions of 100 parts by weight on one component to 72 parts by weight of the other component to effect the production of a Rockwell hardness in the finished insert of between R106 and R110.

8. The method of producing a wood-type golf club head having a ball striking face element cast in place, said method comprising the steps of shaping a wood block to the general form of a club head having top and sole surfaces, heel and toe portions, a hosel, and a front face extending between the heel and toe portions which faces away from a plane extending through the heel and toe portions and the hosel, shaping said front face to provide at the longitudinal mid-region thereof an integral plateau area of substantial size which extends between the top and sole surfaces and projects forwardly from longitudinal end portions of the front surface, cutting away the longitudinal mid-region of said plateau area to provide a recess extending into the club head from said front surface to a predetermined depth, said recess being cut to extend between the top and sole surfaces of the club head so that the top and sole ends thereof are open, closing said open ends of the recess in substantially flush relationship to the top and sole surfaces and to a level commensurate with that of said plateau area by adhesively and removably applying sheet material to the top and sole surfaces of the club head, supporting the club head with said recess opening upwardly, filling said recess with a self-hardening plastic material in liquid form, allowing time for the self-hardening plastic material to harden to a solid state, and then machining said front surface of the club head and the hardened plastic material to provide a relatively smooth finished surface on the club head which is curved in transversely disposed planes and in which the machined surface of the hardened-plastic material is flush with the adjacent wood portions of the finished surface at both sides of the recess.

9. The method of producing a wood-type golf club head of fibrous material having a ball striking face element cast in place, which method comprises the steps of producing a block of fibrous material contoured to encompass the general configuration of a wood-type golf club head having a recess in one surface thereof, filling the recess with a self-hardening plastic material in a liquid form and which wets the fibrous material and bonds itself thereto when it hardens, allowing the self-hardening material to harden for a predetermined period of time, removing portions of the block and the hardened plastic material until said one surface and the hardened plastic material have substantially arcuate configuration in transverse planes and wherein the radii of the arcs extend through the mid-region of the block and are longer than any dimension of the block, said recess extending across said one surface of the block in one direction so that

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the recess has open ends, and covering the opposite open ends of the recess to a level flush with said one surface by the adhesion to the block of flexible sheet material prior to the filling of the recess with the self-hardening plastic material in liquid form.

10. A golf club head comprising a body portion of wood having a striking face, a recess in the striking face of the wood, and a plastic cast in the recess and in the pores of the wood adjoining the recess, said plastic being of a material that wets the fibers of the wood in the uncured state and is self-hardening at atmospheric temperature and pressure.

11. A method for making the striking face of a wood golf club head in which the striking face extends between top and sole surfaces thereof and which method comprises the steps of forming a recess in said striking face which is open at the top and sole surfaces, securing flexible means to the top and sole surfaces across the open ends of the recess to effect temporary closure thereof, pouring plastic into the recess which wets and intimately bonds itself in the recess and the pores of the wood adjoining the recess, and then curing the plastic to final hardness at atmospheric temperature and pressure.

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