AFI CORE OF PLASTIC FOAM MATERIAL

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ABSTRACT

A ski core comprises an elongated core body of plastic foam material, and a screw-holding plate embedded in the core body at an intermediate portion along the length of the core body. The screw-holding plate tightly receives screws fastening a shoe-clamping device to the ski core and may be made of wood, aluminum, or wire netting. The screw-holding plate also serves for the formation of rigid skin layers of the core body around the plate when the core body is molded with the plate contained within the mold cavity.

3 Claims, 19 Drawing Figures
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SKI CORE OF PLASTIC FOAM MATERIAL

BACKGROUND OF THE INVENTION

This invention relates to a ski core which is mostly produced from a foamed resin of a hard type, and nevertheless assures firm attachment of a shoe clamping device to the ski.

Heretofore, the ski core has been made of wood. However, because of the difficulty in obtaining wood material of good quality in recent time, and also of the easiness in obtaining uniform products, and furthermore for facilitating the mass production of the core, core of a plastic foam of hard type has been studied intensely. The core of a hard plastic foam (for instance, a polyurethane foam having a specific gravity of from 0.4 to 0.7) can be produced by pouring the resin material as a liquid into a metal mold and by hardening the resin material in a foamed state, and for this reason, the formation of the core is extremely simple, and uniformity of the products may also be assured. Furthermore, the products thus obtained have excellent water-resistivity and a sufficient toughness in bending.

However, when the core of a plastic foam includes a thicker portion and a thinner portion, not only the plastic foam in the thicker portion tends to become coarse in its cellular structure, but in some cases, even cavities or bubbles are frequently formed in the thicker portion of the core. The coarse cellular structure as described naturally causes unevenness in its strength and balance of the core, and the nature of the ski employing such a core will be impaired. Furthermore, when a shoe-clamping device or steel edges are mounted on the core body of the ski by means of screws or the like, the screws cannot be held firmly in the cellular structure of the core, and they may be loosened out in time. In addition, when a bending moment is applied to the core having such a coarse cellular structure, bending stress is concentrated in the foam material in the close vicinity of the cavities, and the material tends to be broken from these portions.

It has been generally known in the production of plastic foam products that a number of bars or pipes of a suitable diameter are beforehand implanted in a metal mold at a position where the coarse cellular structure tends to be formed, and that a denser cellular structure is formed in that portion of the mold by partly exhausting gas through the holes or by cooling the portion quickly. However, it will be apparent that the procedure cannot be applied to the ski core because of its extreme length and of the difficulty in removing the products out of the metal mold. In addition, if such a construction is employed in the ski core, screws for fixing the shoe-clamping device and the steel edges may fall into the holes formed through the core body, and the holding nature of the core material for the threaded portions of the screws will be utterly lost.

SUMMARY OF THE INVENTION

Therefore, the primary object of the present invention is to provide an improved core of a plastic foam wherein portions to which a shoe clamping device or the like is attached by means of screws are strengthened so that the threaded portions of the screws are firmly held in the strengthened portions.

Another object of the present invention is to provide an improved core of a plastic foam wherein the strengthened portions engaging with the screws for attaching the shoe clamping device or the like are sufficiently rugged and there is no possibility of causing breakage of the core body starting from these portions.

Still another object of the invention is to provide an improved ski core made of a plastic foam wherein the partial reinforcement of the core body can be achieved by a simple and economical manner.

An additional object of the invention is to provide an improved ski core made of a plastic foam wherein the core body is reinforced in such a position as never impair the balance and flexibility of whole ski core.

These and other objects of the present invention can be achieved by an improved ski core comprising a core body of a plastic foam and a screw-holding plate embedded in the core body and located immediately along its length.

In another aspect of the invention, the objects of the invention can be achieved by an improved ski core made of a plastic foam wherein net-like substances are embedded near the upper and lower surfaces of the core body.

In still another aspect of the invention, the above described and other objects of the invention can be achieved by an improved ski core made of a plastic foam wherein metal-wire nets are embedded in the required portions of the core body.

The invention will be better understood from the following detailed description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

In the drawings:
FIG. 1 is a longitudinal sectional view of a ski core employed for constructing a ski;
FIG. 2 is a fragmentary perspective view showing the central portion of the ski core which is constructed in accordance with the first embodiment of the invention;
FIG. 3 through 5 are cross-sectional of the central portion of a ski core constituting various examples of the first embodiment of the invention;
FIG. 6 through 8 show other examples of the screw holding plate, in which FIG. 6 and FIG. 8 are fragmentary perspective views and FIG. 7 is a longitudinal sectional view;
FIG. 9 is a lateral sectional view of still another example of the screw holding plate;
FIG. 10 is a lateral sectional view of one more example of the screw holding plate, in which two plates are embedded;
FIG. 11 is a perspective view of one part of a ski core constituting the second embodiment of the present invention;
FIG. 12 is a longitudinal sectional view of one part of a ski core shown in FIG. 11;
FIG. 13 is a perspective view of one part of a ski core constituting another example of the second embodiment of the present invention;
FIGS. 14 and 15 are perspective views of ski cores constituting examples of the third embodiment of the present invention;
FIG. 16 is a longitudinal sectional view of a ski core employed for explaining another example of the third embodiment of the invention;
FIG. 17 is a cross-sectional view of a ski core taken along the line XVII - XVII in FIG. 16;
FIG. 18 is a cross-sectional view of a ski core assembled into a completed ski body; and
FIG. 19 is a cross-sectional view of a ski core constituting another example of the third embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGS. 1 and 2, on the upper surface of the central portion of an elongated core body 1 consisting of a hard plastic foam molded in a metal mold into a suitable form and extended along the substantial old part of a ski, there is embedded a screw holding plate 2 consisting of a piece of wood or aluminum, and on the lower surface of the core body 1, along its both side edge portions, screw holding plates 3 and 4 consisting of the same material are embedded for attaching running edges of the ski.

The width and the length of the screw holding plate 2 correspond to those of the attached position of a shoe-clamping device for the ski. However, in consideration of the total strength of the ski and the allowable variation of the attached position of the same device, the length of the plate 2 may be determined to be longer than the above mentioned length. The screw holding plates 3 and 4 are embedded at both sides of the lower surface of the core body 1 for firmly holding the screws which are employed for attaching running edges or steel edges not shown, and the lateral width of these plates 3 and 4 are comparatively narrower.

In FIGS. 3 through 5, there are indicated various examples of the screw holding plate 2 which are so formed that the plate 2 can be firmly embedded in the upper surface portion of the core body 1 and unexpected removal of the plate 2 is thereby prevented.

In the example shown in FIG. 3, tapered surfaces 5 and 6 are formed on the both side edges of the screw holding plate 2 along its length, whereby the plate 2 of trapezoidal cross-section is embedded in the core body in a dovetailed manner. In the example shown in FIG. 4, the plate 2 is provided with laterally-extending flange-shaped projections 7 and 8 along its length at the lower portions of the both side edges, and in the example shown in FIG. 5, grooves of dovetailed cross sections are beforehand formed in the screw holding plate 2 as illustrated by 9 and 10, and the screw holding plate 2 is thereafter embedded in the plastic foam core body 1 so that the grooves 9 and 10 are filled with the plastic foam of the core body 1. By this way, the screw holding plate 2 in all of the above indicated examples contacts the surface skin layers of the plastic foam core body 1 except the upper surface of the plate 2, so that firm bonding of two portions is thereby assured.

The embedding of the screw holding plate 2 in the core body 1 is attained by firstly placing the screw holding plate 3 and 4 on the inner lower surface of a metal mold and mounting the screw holding plate 2 on the inner upper surface of the metal mold by the use of a double-face adhesive tape or by the use of a spacer interposed between the mold and the plate 2, pouring a foamy resin mixed with a foaming agent into the metal mold, and heat-foaming the resin integrally so that a core body 1 of foam material embedded with the screw holding plate 2 is obtained. In this construction, since the side surfaces and the lower surface of the screw holding plate 2 are surrounded by the core material, the surface area of the plastic foam core material contacting the screw holding plate is increased and the surface skin layer 11 of tight structure is thereby formed in wider area. As a result, the strength of the ski core is also improved.

When a shoe clamping device or running edges are attached to this core thus obtained, the threaded portion of the screws is firmly seized by the screw holding plate 2 and also by the screw holding plates 3, 4, and any possibility of loosening and dropping out of the screws can be eliminated. Furthermore, the tightening stresses caused by the tightened screws mainly act upon the screw holding plates, whereby creation of cracks in the core body or lateral breaks of the core body due to the shearing force acting upon the core body from outside of the ski core can also be prevented.

The screw holding plate 2 is embedded in the core body at a position where the thickness of the core body becomes heavy. For this reason, the thickness at the central portion of the core body can be as much reduced, and the plastic foam cellular structure of that portion of the core body can be made tighter.

Longitudinal end portions of the screw holding plate 2 may also be configured as shown in FIG. 6 wherein the end portions are corrugated in the lateral direction or merely tapered as shown in FIG. 7 for preventing cracks caused in the core body at the end portions of the screw holding plate 2. Otherwise, the end portions of the plate 2 may be formed as shown in FIG. 8 wherein the configurations of FIGS. 6 and 7 are combined together.

FIG. 9 shows still another example of the screw holding plate 2. In this example, a required number of through holes 12 are bored through the screw holding plate 2 so that the connection between these two members is further strengthened. The holes 12 have conical tapered walls and are arranged alternately in opposite directions.

When it is desired, another screw holding plate 2' may also be employed besides the above described screw holding plate 2, as shown in FIG. 10, and these two plates 2 and 2' may be engaged by screws 13 holding a shoe-clamping device to the ski core.

In the above described example, the screw holding plates 2, and 2' are beforehand fixed in the metal mold, for instance, by the use of an adhesive tape or suitable supporting frames (or spacers) which are previously placed in the suitable positions in the metal mold so that exact positioning of these plates within the core body is assured.

In all of the afore-said examples, it was found that a thickness of from 3 mm to 5 mm is suitable for the screw holding plates 2, 3, and 4, when these plates are made of wood, and a value from 0.8 mm to 1.2 mm thereof is suitable for the plates made of aluminum. By the way, the width of the screw holding plates 3 and 4 is determined to a value between 7 mm and 10 mm.

In FIGS. 11 and 12, there is indicated another embodiment of ski core body 1 of which is made of a plastic foam such as a polyurethane, polyester, or epoxy foam, and net-like members 2a and 2'a are embedded or buried in the plastic foam near the upper and lower surfaces thereof. Because the net-like members 2a and 2'a are buried within the core body 1, skin layers 14 and 14' are formed in the adjacent portions of the core body 1. The net-like members may be wire nets of metal or thermoplastics such as nylon or polypropylene.

FIG. 13 shows another example of this embodiment, wherein one more net-like member 15 is placed at
about middle portion of the thickness of the core body 1, and by the existence of the net-like member 15, skin layers 16 and 17 are formed at the upper side and the lower side of the member 15 respectively. When the ski core of this type is manufactured, a mold formed into a predetermined ski configuration is employed, and the net-like members are beforehand placed inside of the mold. The resin material poured into the mold as a liquid is allowed to flow inside of the mold, penetrating through the meshes of these net-like members freely, whereby formation of the plastic foam core can be accomplished satisfactorily. Because of the easiness of the pouring, the mold may be provided with only one pouring-in aperture.

In the case where the example of core shown in FIG. 13 is manufactured, a mold separable into upper and lower halves is employed, and the central layer of net-like member 15 is extended into the joining portion of the upper and lower halves of the mold to be supported therein. Then, the foamy resin is poured inside of the mold as described above, and foamed and solidified in this state.

With the above described construction, the plurality of net-like members are buried in the plastic foam of the core body for constituting a unified core, and during the foaming process, the net-like members effectuate contacting pressure to the foaming resin and also accelerate the cooling of the foaming resin so that skin layers are formed around the net-like members.

Because of the existence of the net-like members and also of the existence of the skin layers, the shearing strength of the ski core is much elevated and the shock-resisting nature is remarkably improved.

Furthermore, the weight of the ski core employing the net-like members can be reduced substantially, and the bonding nature to other components of the ski is also much improved.

Referring now to FIGS. 14 and 15 showing still another embodiment of the present invention, the core is composed of a core body 1 of a hard plastic foam and a metal wire net 18 formed into a wavy or corrugated shape.

The metal wire net 18 may be waved or corrugated either in the longitudinal direction of the core body 1 as shown in FIG. 14 or in the lateral direction thereof as shown in FIG. 15. In either of the cases, the metal wire net 18 is beforehand placed in the required position within the metal mold, and then the foamy resin is poured into the mold. The resin is thereafter foamed inside of the metal mold so that the metal wire net is included inside of the plastic foam, and during the foaming process, heat distribution inside of the metal mold is equalized by means of the metal wire net which is in itself a good heat conductor, whereby a uniform foaming of the resin is assured.

When the ski core uniformly foamed as described above and including therein a wavy-shaped metal wire net is employed inside of the ski, there is no possibility of causing breakage or lateral cracks in the ski even if a shearing force due to the bending of the ski is applied to the ski core.

Furthermore, when a shoe-clamping device is attached to the ski, the thread portion of screws employed for attaching the shoe-clamping device to ski engages into the mesh of the metal wire net included within the core body 1, and the screws are firmly seized by the ski core. It should be understood that the foama-