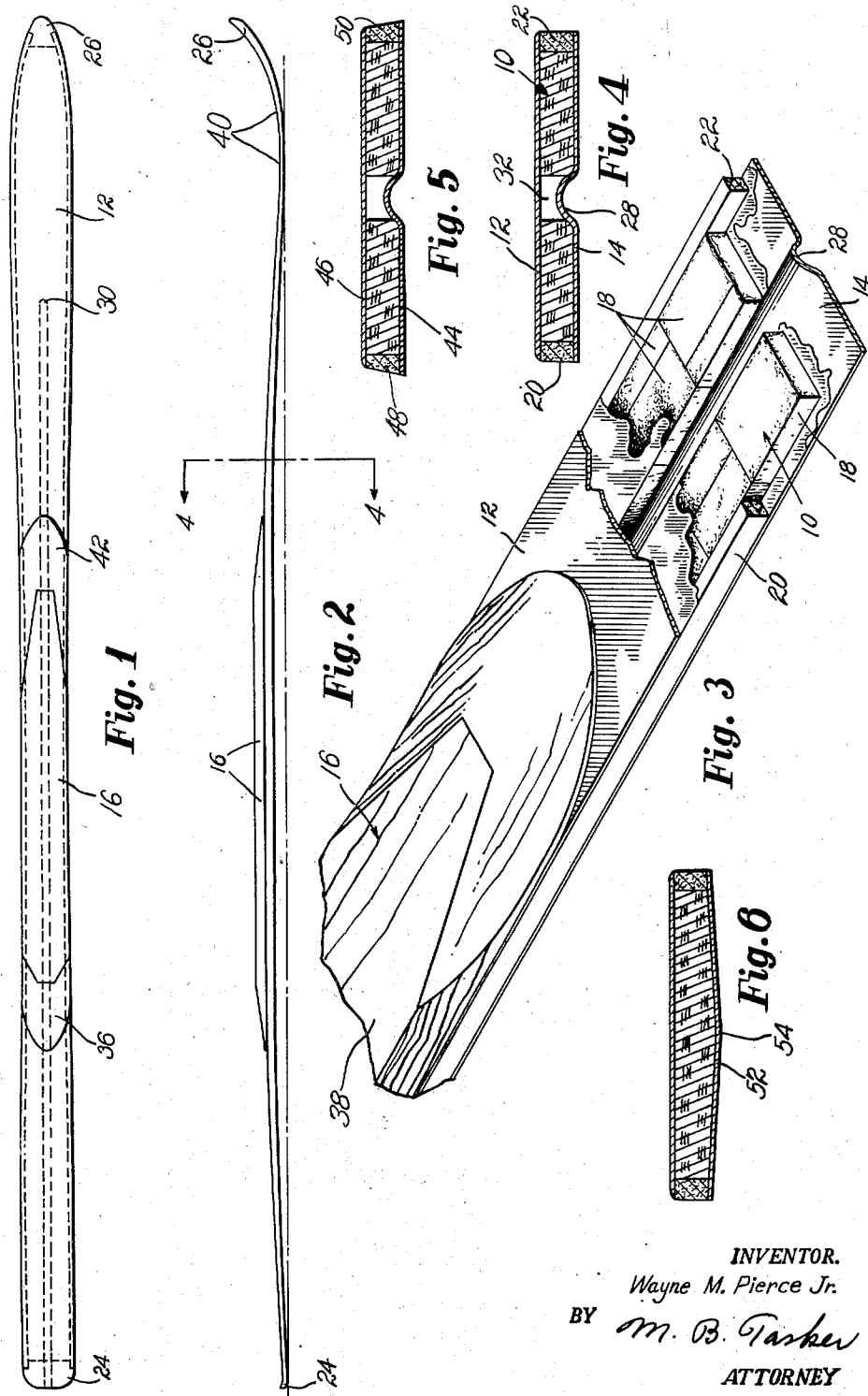


Oct. 10, 1950

W. M. PIERCE, JR
SKI OF LAMINATED CONSTRUCTION

2,525,618

Filed March 1, 1946



INVENTOR.
Wayne M. Pierce Jr.
BY *m. B. Parker*
ATTORNEY

UNITED STATES PATENT OFFICE

2,525,618

SKI OF LAMINATED CONSTRUCTION

Wayne M. Pierce, Jr., Milford, Conn., assignor to
United Aircraft Corporation, East Hartford,
Conn., a corporation of Delaware

Application March 1, 1946, Serial No. 651,172

18 Claims. (Cl. 280—11.13)

1

This invention relates to skis.

There are few woods which possess the requisite strength, wear resisting qualities and flexibility to make good skis. From these woods only selected billets can be used as any defect will alter the physical characteristics of the ski and may become dangerous when made into a ski. Even with careful selection of the wood it is difficult to match the skis of a pair to obtain identical physical properties so the mass production of matched wood skis of high quality has never been possible.

As a result of the increase in popularity in skiing as a sport and the growing scarcity of wood suitable for making skis, various attempts have been made to construct skis entirely of metal. But these have as yet been unsuccessful in comparison with skis made of wood. Attempts have also been made to construct skis of either horizontal or vertical laminates in an effort to utilize the available wood. All of these constructions have failed to meet the need for a ski which will have the desired physical characteristics and yet can be produced in quantity and at a reasonable cost.

It is an object of this invention to provide a ski construction utilizing materials which are available in quantity and enabling the mass production of skis having to a high degree all the desirable physical properties.

Another object of the invention is to provide improved constructions enabling the mass production of skis of uniform physical characteristics.

A further object of the invention is to provide an improved ski of vertically laminated construction and, more specifically, to provide a ski having a core of improved built-up construction and upper and lower facing sheets adhesively secured thereto.

A still further object of the invention is to provide an improved ski of this general type having outer metal facing sheets.

A yet further object of the invention is to provide an improved ski construction of metal and wood laminates having improved characteristics.

A further object of the invention is generally to improve the construction and operation of skis.

These and other objects and advantages of the invention will become apparent from the following detailed description of a preferred embodiment of the invention considered in connection with the accompanying drawings which are submitted for purposes of illustration only and are

2

not intended to define the scope of the invention, reference being had for this purpose to the appended claims.

In these drawings,

Fig. 1 is a top plan view of a ski constructed in accordance with the present invention;

Fig. 2 is a side elevation of the ski shown in Fig. 1;

Fig. 3 is an enlarged detail with parts broken away to show the construction of the core sheet;

Fig. 4 is a section on line 4—4 of Fig. 2;

Fig. 5 is a section similar to Fig. 4 of a modified construction; and

Fig. 6 is a section similar to Fig. 4 of another modified construction.

As shown in Figs. 1 to 4, the improved ski includes a relatively thick core sheet generally indicated at 10, upper and lower facing sheets 12 and 14 respectively and a rigid foot pad 16 which is secured to the upper face of facing sheet 12 intermediate the length of the ski.

Herein, the core 10 is formed mainly of a plurality of adhesively connected sections 18 of end-grain balsa wood having a thickness along the grain equal to the space between the upper and lower surface sheets 12 and 14, as this construction has been found to produce superior results. The core also includes side strips 20 and 22 of harder material which extends along the side edges of the core sheet and are notched into heel and toe caps 24 and 26 which are preferably of the same hard material. The light, cellular balsa wood sections of the core sheet are thus enclosed on all sides by the harder more wear resisting material of the side strips and end caps. The material of the strips and caps may be hard wood such as maple or, as shown, may be formed of a phenolic resin material having good wear resisting quality.

The facing sheets 12 and 14 are preferably thin sheets of hard aluminum alloy which are adhesively secured to the upper and lower faces of the core sheet. The lower facing sheet 14, as best shown in Figs. 3 and 4, has a longitudinal flute, or groove, 28 formed therein which extends from a point 30 (Fig. 1) rearwardly to the end of the ski to give directional stability to the ski. While the balsa wood portion of the core sheet may be correspondingly grooved to receive the flute 28, preferably a slot 32 is cut in the core sheet from the rear end thereof forward to the point 30 into which the flute 28 projects.

A foot pad 16 of suitable wood, such as mahogany, to which the harness is attached is adhesively secured to the upper surface of facing

3

sheet 12 intermediate the ends of the ski. This foot pad is preferably of substantial thickness enabling the fastenings for the harness to be screwed into the side walls thereof wholly above the upper facing sheet 12 so that the fastenings do not extend into the ski proper. The foot pad presents a flat bottom surface (not shown) abutting the facing sheet 12 and a flat top platform 38 and has faired end portions 36 and 42 which merge into the plane of the facing sheet 12.

In making the ski, the end grain pieces of balsa wood are adhesively secured together to form a sheet of core material with the grain of the pieces running normal to the plane of the sheet. The balsa wood sheet and the side strips are then shaped to provide the variation in thickness desired in the ski from the rear end to the front end thereof. It will be noted that the core where it joins the toe cap is relatively thick but tapers quite abruptly to the thinner section 40 where the bend in the forward end of the ski is made. The core then becomes increasingly thicker toward the intermediate portion of the ski which carries the foot pad from which it tapers gradually in thickness to the heel cap 24.

When the core parts including the balsa wood sheet, the side strips and the end caps have thus been shaped to give the desired thickness in the ski from end to end, and the channel 32 has been cut in the balsa wood core sheet, the several parts comprising the finished core sheet are coated with a suitable adhesive and assembled with the facing sheets 12 and 14 which are similarly coated on their surfaces adjacent the core sheet. The assembly is then placed in a mold having the desired curvature to produce the required bend at section 40 and the proper camber for the ski and is held forcibly against the mold surfaces until the adhesive has set, or cured. Any adhesive may be used which will produce a strong weatherproof bond between the wood and metal surfaces. A number of well-known adhesives suitable for the purpose are available, but one of the phenol-formaldehyde resins is preferred since these produce a bond between wood and metal having very great strength and also are capable of creating a high-strength bond between the resin side strips 20, 22, the balsa wood core sheet, the metal facing sheets 12 and 14 and the end caps. The foot pad 16 can be adhesively secured to the upper face of sheet 12 at the same time the core and facing sheets are assembled, or, if desired, the foot pad can be subsequently secured to the ski as a separate operation.

In Fig. 5 a modified construction has been shown in which the bottom facing sheet 44 is wider than the top facing sheet 46 and the outer edges of the side strips 48 and 50 are accordingly beveled inwardly and upwardly at an angle of approximately 10°. This provides sharp lower edges which can be resharpened by filing as is sometimes done in racing to obtain increased grip in performing fast maneuvers.

In Fig. 6 a further modification has been shown which has particular advantages in hard packed snow. In this construction instead of a groove in the bottom facing sheet, as in Figs. 1 to 4, the bottom sheet 52 is formed in the shape of a shallow V with the apex 54 located in the longitudinal centerline of the ski. The two sides of the V have an angle of approximately 3° with the horizontal and extend from the centerline to each edge of the ski. The V-bottom construction extends forward and terminates at about the

4

same point as the groove 28 described in connection with Fig. 1. In use, the apex of the V cuts into the snow and tends to keep the ski on a straight course and prevent side slip.

It will be evident that as a result of this invention it has been made possible to produce skis in mass production which will be alike in all physical characteristics so that the skis of a pair will have exactly the same flexibility, resilience, torsional resistance and other characteristics which are necessary to produce a perfectly matched pair. It will further be evident that this has been accomplished without the necessity of carefully selecting wood which when made up into skis will have the desired characteristics. It will further be evident that due to the lightness of the core material, the end grain use of the latter and the use of aluminum in the facing sheet a considerable saving in weight is made possible while retaining the requisite strength and other desirable physical characteristics.

The improved ski of this invention has numerous other advantages over previous skis. As a result of having metal outer surfaces and end grain core construction the ski is entirely free from splintering, is less likely to mar and is very wear resistant, tests indicating that it will have double the life of an ordinary wood ski. The necessity of applying metal edging to the bottom of the ski is obviated, and due to the smooth, hard, upper surface presented by the upper aluminum alloy facing sheet snagging, or edge grabbing, when the skis are accidentally crossed is eliminated. In fact, stems can be performed safely with the points in actual contact. Superior edge control, or "bite," is also obtained as a result of the high torsional stiffness of the improved skis without sacrificing longitudinal flexibility or strength. When, as a result of hitting stones or other hard objects, the bottom surface or edge of the ski shows gouges or nicks, they may be removed by a light filing of the bottom surface or edge without damaging the gliding properties of the ski.

As a result of the improvements described herein, warping and checking are eliminated, since there are no exposed wood surfaces. Due to the ability of the end-grain core material to be squeezed easily in a direction transverse to the direction of its grain, it is easy to form the desired curvature along the length of the ski, including the abrupt toe bend. Because of this lack of resistance of the core material to squeezing laterally of its grain, and the superior bond to the end-grain surfaces there is an accompanying lack of spring back when the ski is removed from the mold following curing, thus greatly facilitating its manufacture. This characteristic of the ski to retain its shape accounts for the fact that clamps and spreads need not be used with the skis during storage to keep them in shape, as the skis retain their camber and toe bend indefinitely as a result of the construction above described. Another advantage is the freedom from dangerous fractures or complete breaks which frequently result in extremely violent falls causing serious personal injury, this being due to the high strength of the improved ski which enables it to resist fracture and the progressive nature of the failure of the improved ski when failure does occur as compared with the abrupt splintering fractures encountered in wood skis. Further, due to their hard, smooth surface, the skis do not ordinarily require the application of a coat-

ing of wax or lacquer. This factor relieves the skier of a tedious task.

It will also be noted that by making the laminated ski proper separate from the foot pad and attaching the latter above the upper metal facing sheet, there is no danger of starting a crack in the ski body due to the wedging action of the screws used in attaching the harness which may under repeated flexing of the ski, extend and ruin the ski. The foot pad being rigid and of sufficient thickness to permit proper screw attachment of the harness overcomes this difficulty which has been particularly troublesome in laminated skis.

The invention has been described herein as embodied in personal skis, but it will be understood that the invention is equally adapted to skis used as landing gear for airplanes or other forms of snow gliding devices.

While certain specific embodiments of the invention have been described herein for purposes of illustration, it will be understood that the invention is not limited to these details but that numerous changes in the arrangement and construction of the parts may be made without departing from the scope of the appended claims.

What it is desired to secure by Letters Patent is:

1. A ski including a core sheet of fibrous material having the grain of the fibres disposed generally normal to the plane of the sheet, said sheet varying in thickness along the length thereof to provide the desired variation in the thickness of the finished ski, and relatively thin facing sheets adhesively secured to said core sheet on the opposite faces thereof and abutting the ends of the grain of the material of said core sheet.

2. A ski including a core sheet consisting of a plurality of pieces of wood adhesively secured together to form an integral core sheet with the grain of the pieces running normal to the plane of the sheet, and relatively thin facing sheets of metal adhesively secured to the end grain surfaces of said core sheet.

3. A laminated composite ski including upper and lower metal sheets and an intermediate core sheet having said metal sheets adhesively secured to its upper and lower faces, said core sheet comprising a fibrous material in which the fibres run generally normal to the planes of the sheets, and a foot pad adhesively secured to the top surface of the ski intermediate its ends.

4. A laminated composite ski comprising a relatively thick core sheet having its thickness varied throughout its length to provide the normal variation in thickness of the ski, said sheet consisting of a plurality of pieces of wood secured together to form an integral core sheet and having the ends of the grain of the wood comprising the pieces disposed generally normal to the plane of the sheet, relatively thin facing sheets of light metal adhesively secured to the opposite faces of said core sheet abutting the end grain surfaces thereof, and a foot pad secured to the top surface of the upper facing sheet intermediate the ends of the ski having sufficient thickness to permit the attachment of the harness thereto above said upper facing sheet.

5. A laminated ski including a relatively thick core of fibrous material having a longitudinal channel therein providing laterally spaced strips of core material extending from the rear end throughout a major portion of the length of the ski, upper and lower metal facing sheets adhesively secured to the upper and lower faces of

said core sheet including portions overhanging the rear end of said core, said lower surface sheet having a longitudinally extended flute formed therein which extends into the space between said core strips provided by said channel, and means forming a heel for said ski adhesively secured to the rear end of said core and to the inner faces of said overhanging portions of said metal sheets.

6. A laminated ski including a core sheet of wood consisting of a plurality of pieces of wood adhesively secured together and harder strips of material along the side edges thereof adhesively secured to said wood to form an integral core sheet, the wood of said sheet having the fibres thereof running generally normal to the plane of the sheet, relatively thin metal facing sheets adhesively secured to the faces of said core sheet, and a foot pad adhesively secured to the top surface of said ski intermediate the ends thereof.

7. A laminated ski including a relatively thick core sheet having caps of harder material forming extensions thereof at opposite ends, and having strips of harder material extending between said caps along the sides of said sheet, adhesive means for securing said strips and caps to said sheet for framing the edges of said sheet, and facing sheets of thin metal overlying said core sheet and adhesively secured thereto and to said strips and caps.

8. A laminated ski having a core sheet including a central portion of fibrous material and portions of harder material at opposite ends thereof and side strips of harder material extending between said end portions, said core sheet varying in thickness between its ends to provide the desired variation in the thickness of the ski, facing sheets of metal adhesively secured to the faces of said core sheet, and a foot pad adhesively secured to the outer surface of one of said metal sheets.

9. In a laminated ski, a core sheet consisting of a central wood portion, caps of phenolic material and side strips of phenolic material extending between said caps, said caps and side strips being adhesively secured to the edges of said wood portion to provide an integral core sheet, and facing sheets of metal adhesively secured to opposite faces of said integral core sheet.

10. A laminated ski having a central core sheet of substantial thickness and metal facing sheets of lesser thickness adhesively secured to said core sheet on the upper and lower faces thereof, the bottom facing sheet being wider than the top facing sheet and the exposed sides of said core sheet being beveled between the edges of said metal sheets.

11. A laminated ski including a core sheet of substantial thickness having upwardly and inwardly beveled side edges, and upper and lower metal facing sheets of lesser thickness adhesively secured to the upper and lower faces of said core sheet and having their edges conterminous with the corresponding exposed edges of the latter.

12. A laminated ski having upper and lower spaced metal facing sheets, said lower sheet being wider than said upper sheet and an intermediate core sheet adhesively secured to both of said facing sheets having downwardly and outwardly beveled exposed edges between said facing sheets the limits of which are defined by the upper and lower edges of said metal sheets.

13. A laminated ski having upper and lower metal facing sheets, said lower sheet being in the form of a shallow V throughout a portion of

7

its length, an intermediate core sheet conforming to the inner surfaces of said facing sheets, and adhesive means between the abutting surfaces of said sheets for securing them together.

14. A laminated composite ski including a core sheet of fibrous material having the fibers running transverse to the plane of the sheet, relatively thin facing sheets of metal adhesively secured to the upper and lower faces of said core sheet abutting the ends of the fibers thereof, and a footpad secured to the outer surface of said upper sheet intermediate the ends of the ski.

15. A laminated ski having a core sheet including a central portion of fibrous material and portions of harder material at opposite ends thereof and side strips of harder material extending between said end portions, said core sheet varying in thickness between its ends to provide the desired variation in the thickness of the ski, upper and lower facing sheets of metal adhesively secured to the opposite faces of said core sheet, and a footpad secured to the outer surface of said upper facing sheet.

16. A laminated ski having a core sheet including two strips of low density material spaced apart laterally to form a central channel extending longitudinally of the ski throughout a major portion of its length, members of higher density material surrounding the periphery of said core sheet and adhesively secured thereto, and facing sheets of metal adhesively secured to the upper and lower faces of said core sheet and bridging said channel at the top and bottom thereof, said lower facing sheet having a longitudinal flute entering into said channel.

17. A ski comprising a core sheet including a plurality of pieces of wood adhesively secured together to form an integral core sheet with the

8

grain of the pieces running normal to the plane of the sheet, said core sheet varying in thickness between its ends to provide the desired flexibility in the ski, side strips adhesively secured along the edge of said core sheet having a higher density than said core sheet, and relatively thin facing sheets of metal adhesively secured to the end grain surfaces of said core sheet.

18. A laminated ski having a core sheet including a section having a plurality of pieces of fibrous material adhesively secured together with the grain of the pieces running normal to the plane of the sheet and strips of harder fibrous material along the side edges thereof adhesively secured to said section to form an integral core sheet, and relatively thin sheets of metal adhesively secured to the end grain surfaces of said section and to said strips.

WAYNE M. PIERCE, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,184,791	Broome	Dec. 26, 1939
2,258,046	Clement	Oct. 7, 1941
2,264,535	Klemm	Dec. 2, 1941
2,356,809	Andreef	Aug. 29, 1944

FOREIGN PATENTS

Number	Country	Date
135,247	Switzerland	Nov. 16, 1929
346,603	Italy	Feb. 25, 1937
641,053	Germany	Sept. 11, 1937
688,194	Germany	Feb. 14, 1940