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LAMINATED SKI

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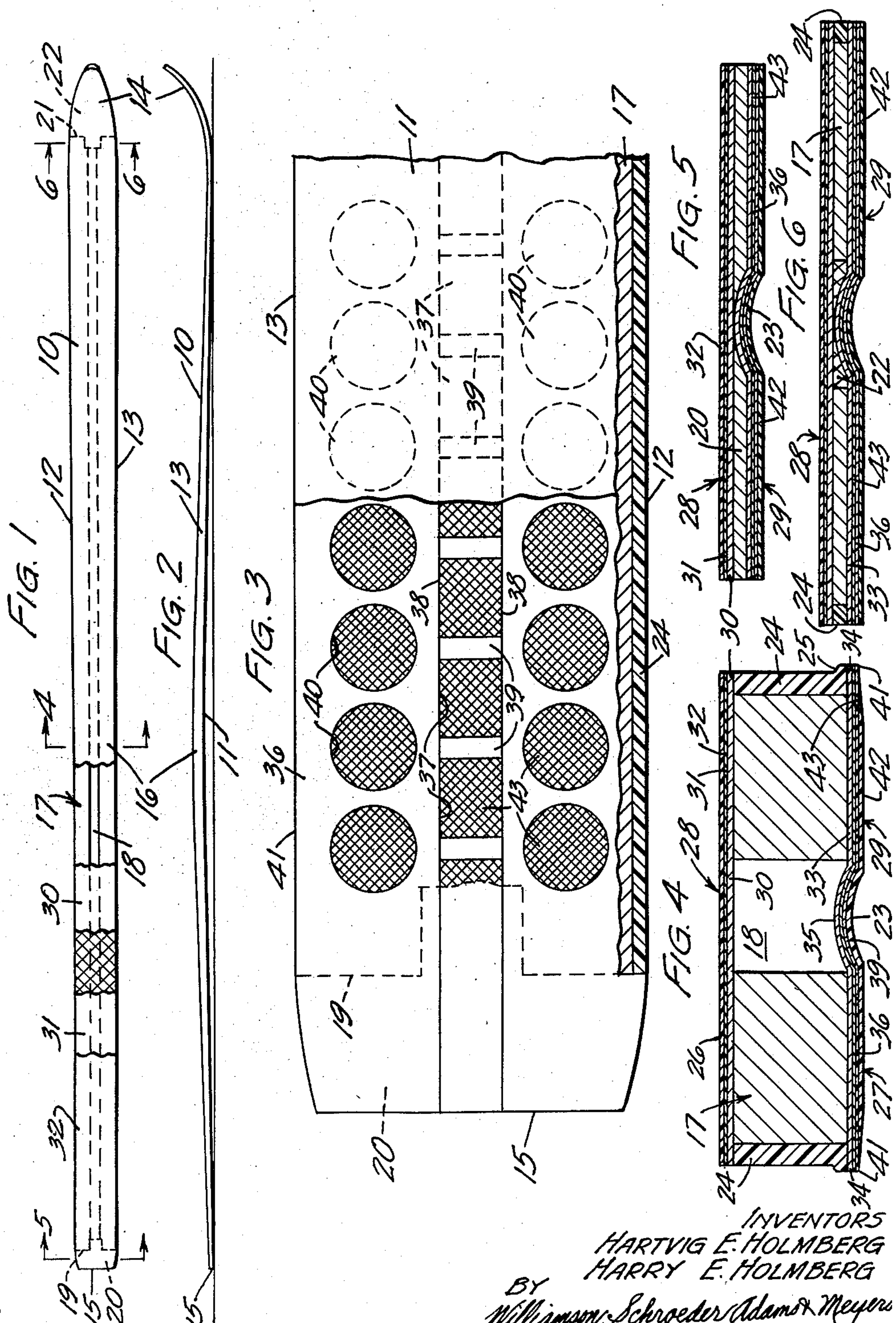

INVENTORS
HARTVIG E. HOLMBERG
HARRY E. HOLMBERG
BY
Williamson, Schroeder, Adams & Meyers
ATTORNEYS

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LAMINATED SKI

Hartvig E. Holmberg and Harry E. Holmberg, St. Paul, Minn.

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This invention relates to skis, and more particularly to skis having laminated structure to better bring out good characteristics of ski performance and construction while minimizing the bad characteristics.

Laminated skis have been known in the prior art for quite some time, and laminating technique has been used in the case of all-wood skis to lessen the tendency of the ski to warp and to prevent splitting and cracking of the ski along the grain structure. In addition, the curvature of various parts of the ski are more easily obtained when separate laminations are dealt with. Such laminated wood skis are light and dependable but lack in wear resistance and in control during use, particularly when the ski has become slightly worn at the lower side edges. It has, therefore, become customary to insert metal wearing edges in the form of strips of steel and the like along the bottom corners and to make such edges sharp by grinding or filing whenever they become dull from usage. Sometimes when the skis are subject to abuse, the edge strips or inserts will become loosened, broken or even ripped out. It is difficult to repair a ski in this condition because the strips have been carefully inlaid and the ends embedded in the internal structure of the ski.

Other types of laminated skis have been proposed in which wood, metal and plastic laminae have been employed. Here again the wearing edges are reinforced with steel strips so as to maintain a sharp edge during the life of the ski. The laminated ski structures having combinations of metal, plastic and the like with steel edge strips have caused considerable trouble in that changes of temperature will cause the ski to behave in a manner similar to a bimetallic strip wherein the internal stresses of the laminations having different coefficients of expansion will create a warping or bending along the length of the ski. Also, the bonded laminae including plain sheets of metal often become loosened through rough usage or temperature changes and cause the ski to lose its resilience and efficiency.

The ski construction of the present invention contemplates a laminated structure which will overcome the above noted objections, and it is an important object hereof to provide a ski having different laminated materials efficiently combined to form a light weight, dependable ski which is strong and will not warp under extreme conditions of weather and usage.

It is a further object of the invention to provide a laminated ski structure in which a part of one of the laminations provides not only strength and resilience throughout the length of the ski, but also provides a sharp edge at the bottom side corners.

It is a more specific object of the invention to provide a balanced laminated structure in which metallic laminations are applied in groups on both sides of the medial core of material, the grouped laminations having such overall corresponding coefficient of expansion as to prevent the ski from warping.

It is a still further object of the invention to provide

a laminated ski structure in which at least one of the laminations above the core structure is constructed from sheet steel, and at least one of the laminations below the core structure is likewise constructed of sheet steel and extends outwardly to further function as a wear-resisting sharp running edge.

A still further object of the invention resides in novel steel plate lamination at the underside of the ski in which the longitudinal running groove is bridged by a steel plate selectively perforated in such manner as to be conveniently formed in recessed manner within the groove, said perforations also strengthening the bond of the steel plate to the rest of the ski and at the same time lightening the structure without sacrificing the aforementioned properties.

These and other objects and advantages of the invention will more fully appear from the following description made in connection with the accompanying drawings, wherein like reference characters refer to the same parts throughout the several views and in which:

Figure 1 is a plan view of our laminated ski, portions thereof being segmentally layered and hidden parts shown in dotted line;

Figure 2 is a side elevation of the ski;

Figure 3 is an enlarged rear end segment of the bottom of our ski structure, layers being cut away to better show the internal structure of the ski; hidden portions being indicated in dotted line;

Figure 4 is an enlarged cross section taken on the line **4—4** of Figure 1;

Figure 5 is an enlarged cross section taken on the line **5—5** of Figure 1; and

Figure 6 is still another cross section taken on the line **6—6** of Figure 1.

With continued reference to the drawing, our ski is shown in overall configuration in Figs. 1 and 2. The ski is laminated and has a conventional shape comprising an upper surface **10**, a lower surface **11** and side edges **12** and **13**. The fore of the ski is turned upwardly at **14** and the rear of the ski terminates in a heel **15**. The medial portion of the ski **16** is somewhat arched and of thicker dimensions, all as is commonly known in the art.

Our invention resides in a particular laminated structure which provides light and strong construction with long-wearing running edges without necessitating the embedding of individaul wear strips. The body or core **17** of the ski is preferably formed of wood and we have found that a pressed and bonded material formed of wood particles in which the grain is randomly disposed provides an ideal strong and resilient structure. It is, of course, requisite that a ski have a certain degree of resiliency, yet must not whip or flex excessively. The core **17** may be solid throughout, but we prefer that a medial portion **18** be formed as a longitudinal hollow space since the strength of the ski is adequate and the elimination of the medial material will further lighten the ski. The practice of providing hollow cores is also well known in the art. However, we believe that the selection of bonded wood particles of random fiber is an innovation which has not before been discovered in the art of controlling resilience in ski construction. The core **17** extends substantially for the length of the ski and terminates rearwardly at **19** and preferably short of the overall rearward termination **15** of the ski. A heel plate **20** of aluminum or other suitable material is positioned in the plane of the rearmost narrow and thin end **19** of core **17** so as to give additional strength at this vulnerable area.

Similarly, the forward and widened terminus **21** of core **17** has a curved toe plate **22** which forms the forward continuation of the core **17** and the body area of the curved forward end **14** in the completed ski structure.

The heel and toe plates 20 and 22 provide continuations of the side edges 12 and 13 in a smooth and uninterrupted manner. The toe plate 22 is preferably ungrooved, while the heel plate 20 has an upwardly arched groove 23, as shown in Fig. 5, to match the remainder of the ski, as will be subsequently described.

In order to improve the appearance of the ski and to provide more resistant side structures 12 and 13, a thin strip 24, preferably of tough plastic, is bonded to the side edges of core 17, as shown in Figs. 3 and 4. The strip 24 may have an outward flare 25 at the bottom thereof to support and register the laminated structure presently to be described. The core 17, thin plastic strips 24, heel plate 20 and toe plate 22 in their proper position all constitute a smooth and continuous upper surface 26 and a lower surface 27, as shown in Fig. 4.

To the upper surface 26 of the previously described core portions of the ski is laminated a plurality of sheets designated generally at 28. Similarly, a plurality of laminations are bonded together and to the undersurface 27 and are generally designated at 29 in Figs. 4, 5 and 6. The upper laminations 28 consist preferably of a hard aluminum sheet 30 and preferably within a thickness range of from 0.015 to 0.035 of an inch. This hard aluminum has a rather high coefficient of expansion which must be given careful consideration. The heel and toe pieces 20 and 22 may be constructed of softer aluminum and their coefficients of expansion may vary considerably because of their relatively short lengths. The aluminum sheet 30 covers the upper surface 26 and preferably extends to the extreme outer margins of the entire ski. The sheet may be bonded to the core 17 with a suitable bonding agent of conventional form. To the upper surface of the aluminum sheet 30 is bonded a spring steel sheet 31. The steel sheet is of tempered carbon spring steel and preferably continuous and imperforate and of a thickness range between 0.006 and 0.010 throughout. The steel sheet 31 is preferably coextensive with the area of aluminum sheet 30 and over the entire upper area of the ski. A final layer 32 of hard plastic material such as a hard plastic sheet, preferably of the phenolic thermo-setting type, is bonded to the steel layer 31 with suitable bonding material and, again, the plastic sheet 32 may be coextensive with the entire area to complete the upper laminated structure 28. It will be observed that the split portions of core 17, side strips 24 and the toe and heel plates 22 and 20 respectively will all be firmly united by the bonded layers 28.

As to the laminated layers 29, the innermost sheet layer 33 is preferably formed of hard aluminum of the same composition and of the same thickness as aluminum sheet 30. The lower sheet 33 has a side edge 34 which preferably extends to each side so as to register with the lower enlarged edge 25 of the side strip 24. A medial longitudinal band 35 is bent upwardly to form a running groove throughout the greater portion of the length of the ski. Bent portion 35 may be conveniently formed at the hollow space 18 running lengthwise of the core 17. Again, the aluminum sheet 33 may be bonded with suitable bonding material to the lower surface 27 of core 17 in the manner described.

An important feature of this invention is the steel lamination 36 which is bonded to the undersurface of aluminum sheet 33. The steel sheet 36 is also constructed of tempered carbon spring steel and is preferably slightly thicker than the steel sheet 31 at the upper surface of the ski. We prefer a thickness of from 0.015 to 0.030 for the lower sheet. The steel sheet 36 is shown in detail in Fig. 3. Sheet 36 is perforated throughout the greater portion of its area and these perforations are discontinuous in nature, yet will have considerable strength in the integral sheet. At least some of the perforations 37 are arranged symmetrically along the longitudinal band defining the raised running groove created by bend 35 in the aluminum sheet 33. The perforations 37 are preferably rectangular so as to present outer edges 38 which register with the terminal lines of the bend 35 and also provide somewhat weakened bridging strips 39 which are capable of being bend upwardly in the same configuration as the longitudinal bend 35, all as shown in Figs. 3 and 4. Since the area of the bridging strips 39 is relatively small compared with the total area of the groove 35, the steel will easily form its bend at each of the strips and be retained in the groove. Solid spring steel has a greater tendency to break loose from its bonded relation and does not conform as readily to the curved groove configuration.

The remainder of the perforations 40 may be of any convenient form and preferably are punched in circular openings, as shown in Fig. 3. The perforations serve to lighten the steel material while, at the same time, preserving the sheet 36 in integral form. The side edges 41 extend outwardly to register with the widened area 25 and the outer edges 34 of the aluminum sheet 33. The edges 41 constitute a hardened running edge at each side of the ski and may be sharpened from time to time during the life of the ski.

Another plastic sheet lamination 42 is bonded to the underside of the steel sheet 36 and may be formed of hard plastic material of a phenolic nature such as a hard plastic sheet preferably of the phenolic thermosetting type. The thickness may vary to some degree. We prefer, however, to utilize plastic sheeting of 1/32 of an inch thickness.

In the technique of bonding the laminations to the core or body structure, we employ pressure of 100 pounds per square inch and a temperature of 300° Fahrenheit. In order to prevent squeezing out of the bonding material, we may insert a spacing material between any of the contiguous metal sheets, as typified by the cheesecloth layer 43 between the metallic layers 33 and 36. The cheesecloth will thus maintain a sufficient amount of bonding material between the metallic surfaces to achieve a strong union. The cheesecloth 43 will squeeze into the openings, as shown in Fig. 3, and carry an amount of bonding material with it so as to unite the layers not only in surface relationship but also in continuous form through the openings.

The upper laminations 28 and the lower laminations 29 are selectively balanced so that the overall coefficient of expansion due to changes in temperature will distribute stresses equally and not cause warping or bending during changes in the weather. The continuous steel layer 36 is counter-balanced by the upper steel layer 31 and the integral quality of the sheet 36 is such as to positively prevent separation or loosening of the running edges 41 and is also so designed in a light structure to interfit in permanent relation with the desirable center running groove.

The particular type of multiple upper and lower laminations combined with a bonded wood particle core in which the fibers are randomly disposed gives a properly resilient ski structure which is damped to the proper degree to prevent chattering or vibrating during use.

It will, of course, be understood, that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of our invention.

What we claim is:

1. In a laminated ski construction, a hard continuous metal sheet bonded at the underside of a ski having a lengthwise groove formed therein, said sheet having discontinuous perforations formed through the surface thereof for the greater portion of its length, at least some of said perforations defining a weakened longitudinal zone medially of the ski consisting of a plurality of bridging strips extending completely across said lengthwise groove and bent upwardly thereinto, and a running surface bonded to the lower face of said perforated metal

sheet, said metal sheet traversing the width of the ski and terminating laterally at each side in exposed running edges.

2. In a laminated ski construction having an upwardly formed running groove in the lower surface thereof, a continuous steel sheet bonded at the undersurface thereof, said sheet having a plurality of discontinuous perforations formed therethrough for the greater portion of the length of said sheet, at least some of said perforations being of such width as to define a plurality of bridging strips extending across at least the width of said running groove and defining a weakened longitudinal zone medially of the ski, said plurality of bridging strips being spaced longitudinally of, and bent upwarly into, said running groove, and a running surface bonded to the lower face of said perforated steel sheet, said sheet traversing the width of the ski and terminating at the bottom corners respectively in exposed running edges.

3. A laminated ski comprising, an elongated core element having upper and lower surfaces and provided with a substantially medially disposed and longitudinally extending slot, a plurality of sheet laminae bonded together and to the upper surface of said core element and bridging said slot, and a plurality of sheet laminae bonded together and to the lower surface of said core element and bridging the aforementioned slot, the upper lamina comprising an aluminum sheet bonded directly to the upper surface of said core, a spring steel sheet bonded to the upper surface of said aluminum sheet and a hard plastic sheet bonded to the exposed upper surface of said spring steel sheet with all of said sheets extending the full width of said core and being continuously exposed along their longitudinal edges at opposite sides of the core, the lower sheet lamina comprising an aluminum sheet bonded directly to the undersurface of said core, a spring steel sheet bonded directly to the undersurface of the last mentioned aluminum sheet and a hard plastic sheet bonded directly to the undersurface of the last mentioned spring steel sheet, the last mentioned aluminum sheet being arched upwardly along a longitudinal medial portion thereof to be disposed within the confines of said slot in the core and the underlying spring steel and plastic sheets being correspondingly deformed upwardly, and said lower spring steel sheet being formed in the longitudinal medial portion thereof directly in register with said slot with a plurality of substantially rectangular and closely spaced openings defining arcuated bridging strips therebetween whereby a relatively small area of the medial portion of said lower spring steel sheet is deformed upwardly beneath the arched central portion of said lower aluminum sheet.

4. A laminated ski comprising, an elongated core element having a substantially medially disposed groove-defining recess extending for the greater portion of the length of said ski, a plurality of upper sheet laminae comprising a sheet of aluminum and a sheet of spring steel bonded together and to the upper surface of the core, and a hard externally exposed plastic sheet bonded in uppermost overlying relation, a plurality of lower sheet laminae comprising a sheet of aluminum and a sheet of spring steel bonded together and to the lower surface of the core, and a hard externally exposed plastic sheet bonded in lowermost underlying relation, said sheet of spring steel in the lower sheet laminae having a series of openings formed longitudinally of the sheet and each opening defining with an adjacent opening a lateral bridging strip, said aluminum and said steel sheets of the lower laminae being deformed upwardly to provide a longitudinal groove within said groove-defining recess, said bridging strips extending at least across the full width of said groove and thereby reducing the area of the steel sheet which is deformed.

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