Nov. 24, 1959 H. F. RIVARD 2,914,335

SKI STRUCTURE

Filed Feb. 18, 1957

FIG. 1.

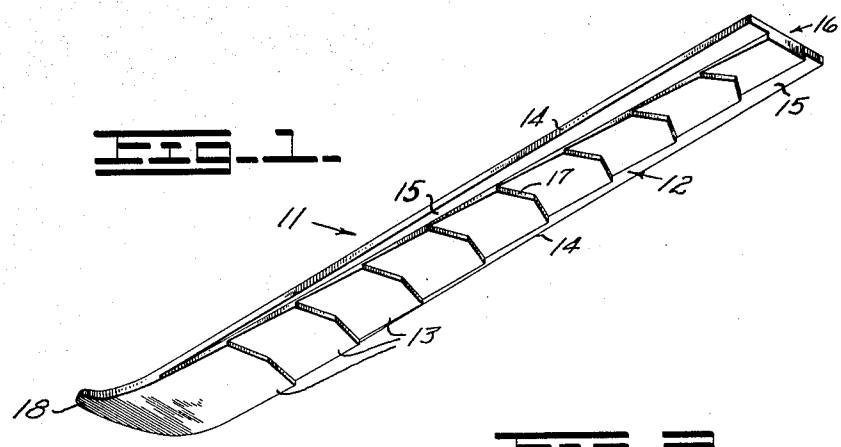


FIG. 2.

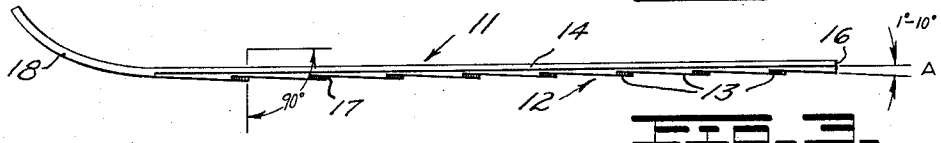


FIG. 3.

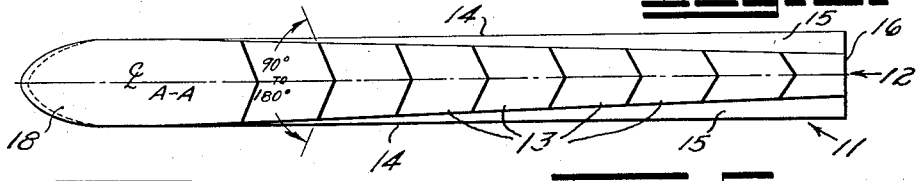


FIG. 4.

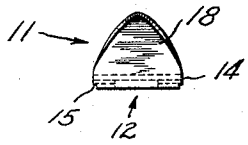


FIG. 5.

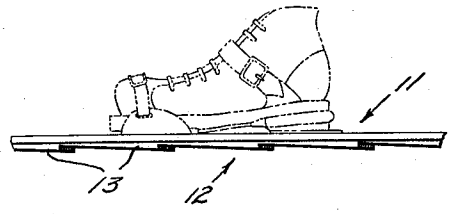


FIG. 6.

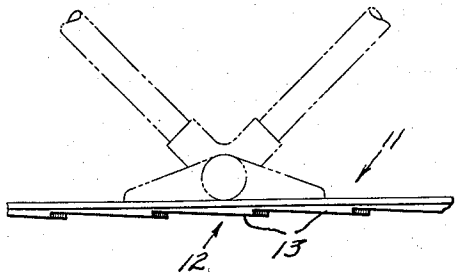
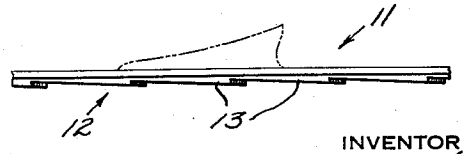


FIG. 7.



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SKI STRUCTURE

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1 Claim. (Cl. 280—11.13)

The present invention relates to a ski structure and more particularly to an improved undersurface for skis especially adapted for the establishment of greatest control for water and snow skis.

In the prior art grooves of varying dimensions on the ski undersurface and running the length of the ski are well known. Metallic edging for skis is also well developed. Ski attachments are known establishing aids to climbing by providing particular traction arrangements. None of these ski structures, however, have provided the ski with satisfactory overall versatility and many of the particular forms of undersurface were developed only as an adjunct for particular skiing tasks, i.e., jumping, slalom, downhill, stunting on water skis, or the like.

It is therefore an object of the present invention to provide a ski undersurface which is equally desirable in water or on ice and snow which combines the desirable elements of control ease with overall amenability to the several ski skills.

More particularly it is an object of this invention to provide a ski undersurface having stepped sets of planal elements extending substantially the length of the ski.

Another object is to provide a ski undersurface which accomplishes a friction reduction as between ski and the medium in which the ski is used while control is obtained through a peculiar turbulence established by the medium in passing contact with the plurality of surfaces.

Another object is to provide a ski undersurface capable of including simple traction for uphill climbing as in snow skiing.

Another object is to provide a ski structure particularly adaptable to use in association with aircraft which is peculiarly stable for landings on ice, snow and water for example without establishing dangerous frictional drag.

In the drawing:

Figure 1 is a perspective view of a ski built in accord with the present invention and illustrating the plurality of transverse planal surfaces forming the undersurface.

Figure 2 is a side elevation of the ski illustrated in Figure 1 providing a clear angular view of the spaced parallel plural planal surfaces.

Figure 3 is a plan view of the undersurface of the structure illustrated in Figures 1 and 2.

Figure 4 is an end elevation showing a ski in accord with the present invention and slightly enlarged as to scale so as to indicate the planal truncations from all points of view.

Figure 5 is a broken side elevation view of a typical snow ski application illustrating associated boot and fastener.

Figure 6 is a broken side elevation view of a ski built in accord with the present invention and showing a typical aircraft mounting in phantom line.

Figure 7 is a broken side elevation view of a ski built in accord with the present invention and including a foot retaining slot typical of a water ski use.

General description

In general the present inventive undersurface for skis comprises a plurality of spaced apart parallel plane surfaces running substantially the length of a ski and superimposed upon a substantially horizontal or base undersurface of a ski. While the rise of these planes is uniform it will be noted that the trailing edge of the planal surface is tapered by an obtuse angle and drops abruptly to form a right angle or perpendicular intersection with the horizontal base surface.

Such surfaces have been found to enhance support, reduce friction, and provide unusually fine turn control in both water and snow. It will be readily appreciated that when the ski structure of the present invention is adapted to the undersurface of water skis the width of the ski at any given cross section is substantially greater than the ski width in snow ski applications. In other general regards the ski structures for snow and water are substantially similar.

As a contributing factor to stability it should be noted that the parallel planes comprising the ski undersurface marginally merge with the edge of the upper surface and taper rearwardly forming an auxiliary indented edge.

Specific description

Referring more particularly to the drawing, Figure 1 illustrates a characteristic ski **11** employing the undersurface **12** which is the subject of the present invention. A plurality of planes or steps **13** run substantially the length of the ski **11**. The planes **13** are all parallel on their outer surface as best indicated in the side elevation in Figure 2. The planes **13** laterally and smoothly merge at the forward end of the ski **11** with the ski edges **14**. The width of the planes **13** diminishes uniformly toward the rear of the ski **11** so that the undersurface **12** provides a generally raised portion extending the length of the ski **11** extending along the centerline A—A (Figure 3). This construction leaves ledges **15** on either side of the undersurface **12** by the indented character of the undersurface in relationship to the ski body. The undersurface **12** is coterminal with the trailing edge **16** of the ski **11**. The width of the undersurface **12** at the trailing edge **16** is between about 40 percent and 90 percent of the total ski width at the trailing edge. The plane-like extensions or steps **13** are canted outwardly and rearwardly from the plane established by the ledges **15** at included angles A ranging from 1 degree to 10 degrees. When the included angle is increased beyond 10 degrees, resistance to forward motion of the ski **11** is increased too materially to be of much use. Below 1 degree the effect of the plurality of canted planes **13** is lost.

The rear edge **17** of each of the plane-like segments **13** drops perpendicularly to the plane established by the ledges **15**. The rear edges **17** of each of the plane-like segments **13** taper rearwardly toward the centerline A—A. The included angle of planes **13** at the rear edge **17** is at least 90 degrees and can extend through the obtuse range approaching 180 degrees. However, as the upper limit of 180 degrees is approached some stability appears to be sacrificed and desirable kinetic pressure keel effect at the centerline A—A is lost. The kinetic pressure keel effect, which appears to provide running stability, is acquired by the pressure differentials along the tapered rear edge **17** of each of the planes **13**.

The upturned front portion **18** of the ski **11** may be varied in accord with specific usage, for example on water, snow or ice, as desired. The undersurface **12** may be of variant length along the ski bottom and the planes **13** may be varied as to size. Obviously the width of skis adapted for water or snow and ice usage may be varied as to all over length and width with consideration being

given to the density of the media in which they are used, the physical characteristics of the user and the towing equipment or prime mover.

Figures 5, 6 and 7 illustrate a variety of applications of the ski of the present invention. Figure 5 shows the characteristic ski boot mounting as used in snow and ice. Figure 6 illustrates an aircraft mounting. Figure 7 illustrates a binding of usual style employed in water ski usage.

The undersurface **12** is manufactured in at least two manners. Firstly, the undersurface **12** may be formed integrally from the same material comprising the ski **11**, or the bottommost lamination thereof where ski **11** is of laminated construction. Secondly, the undersurface **12** may be separately formed as by casting or molding and the like and then attached to the bottom of a conventional ski as by screws, cementitious or resinous material, or other fasteners.

Operation

Skis provided with the undersurface as above described can best be operationally analyzed when operating in a water medium. From a static position the skier is towed and the angle of attack set on the skis by the skier soon brings the skis to the surface until the ski structure supporting the skier is skimming along the surface of the water. As speed increases the buoyancy or support to the skis is increased in accord with known planing effect. The plural planes, however, set at the moderate angle of attack off of the horizontal give an unusual uniform buoyancy of ride believed to result from uniform plural planal contact with the water and always slightly greater in degree than the attack angle set by the skier.

The particular undersurface described also reduces friction probably by the reduction of surface contact with the water support medium while obtaining no appreciable drag effect so long as the angle of the planes is within the stated range from horizontal. Drag effects have been observed as detrimental if the angle is increased.

In maneuverability and stability during maneuvering, skis built in accord with the present invention are observed to be more responsive to control by the skier than hitherto to known ski styles. This phenomenon, certainly unexpected with a surface as herein described, is believed explainable in the following manner. The wake established by the cut-away taper on the plural planal surface is believed to impart a guide effect through the length of the entire ski resisting change of direction very strongly in balanced movement. Weight unbalance, however, immediately destroys the "grooving" and renders the ski amenable to directional change. Immediately upon the directional change having taken effect the wake established by the undersurface restabilizes the units and restores ideal planing conditions. The skis show unusual adaptability to stunting such as jumping and sharp turning. The stability of these skis in choppy water, ordinarily the most undesirable condition for water skis, appears superior to skis of prior known design.

In other regards a stepped or double "edge effect" is achieved by reason of the plane surfaces diminishing in

width from front to back providing an additional edge to assist in guidance and to reduce that portion of frictional resistance due to adhesion from surface tension. This is particularly useful in snow ski work since lateral resistance is increased thereby and stability against sideways movement or "slip" is enhanced.

As applied to snow, obviously the traction of the ski is enhanced by the saw tooth grip established by the backs or trailing edges of the plural planal raised surfaces making the skis easily adaptable to direct climbing of moderate slopes. In downhill running, control appears comparable to the stability effect obtained in water. Vast improvement is noted in slushy snow where conventional skis are known to be treacherous. While no distance records have been set employing skis in accord with this invention for jumping, moderate jumping has been accomplished experimentally and the tests indicate greater ease of take-off and simpler ski control while in the air. The skis appeared to stabilize at landing with somewhat greater ease than conventional structures.

While the structures of the present invention appeared to "load" or "pack" rather easily with snow and ice, once regular forward motion was established the "packing" disappeared and no interfering fouling of the ski undersurface was observed.

It will therefore be seen that the hereinbefore described invention comprises a novel structure having distinct utility and unusual results obtain from its use in structures for traversing water, snow, and slush ice.

Having thus described my invention it will be understood that certain modifications within the skill of the art may be made and such modifications are intended to be included unless the claim negatives such inclusions.

I claim:

A ski having a principal planal undersurface; a raised and rearwardly inwardly tapering centerportion to said undersurface and running substantially the length of said ski the edges of said raised portion being perpendicular to said principal undersurface and having a plurality of overlapping chevron-like parallel plane steps, the angle of attack of said steps being between 1 degree and 10 degrees from the plane of the principal undersurface, the front edge of the forwardmost of said steps blending with said principal undersurface, each of said steps having a trailing edge tapering symmetrically rearwardly to converge on the longitudinal centerline of said undersurface to define an included obtuse angle on the centerliine of said undersurface.

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