This invention relates generally to skis, and is particularly related to improvements which permit the skis to more readily conform to variable terrain conditions as well as affording a torsion-responsive ski which provides improved edging characteristics.

When skating on relatively smooth, hard packed snow or during icy conditions, a relatively stiff ski without too much longitudinal flexibility is preferred. However, when skating in soft powder snow, a relatively flexible ski is preferred.

A primary object of this invention is to increase the adaptability of skis over a greater range of conditions, particularly wherein the more flexible skis will be suitable for use in the conditions normally reserved for relatively stiff skis.

Another object of the invention is to provide a novel ski in which there is afforded a pre-adjusted tip and tail pressure which will adapt to different snow conditions to provide improved tracking characteristics.

In conventional skis, the skier's weight distribution along the ski length is closely related to the bounding rigidity built into the ski. A decrease in the bounding rigidity will decrease the weight sharing capacity of the tip and tail of the ski. Thus, a practical limitation is placed on the minimum bounding rigidity of the ski. Another object of this invention is to provide means for extending the useful range of longitudinal flexibility of the ski by adjusting the weight along the longitudinal ski axis independently of the bounding rigidity of the ski.

Additionally, it is generally recognized that skis with a high torsional rigidity, i.e., resistance to twisting transversely along the longitudinal axis, are easier to turn than skis with relatively low torsional rigidity. This is primarily due to the fact that the more torsion resistant ski will have less ski surface in contact with the snow than the ski that more readily twists. Thus, another object of this invention is to provide skis which include means for adjusting torsional rigidity over a wide range of practical values.

It is further recognized in the art that excessive vibrations and chattering of skis while skiing is indicative that portions of the ski edges are not in contact with the snow and therefore there is a resulting loss of control by the skier. Accordingly, another object of this invention is to provide a ski construction whereby optimum vibrational characteristics are provided.

Additionally, as recognized by the advanced skiers, when attempting to make a parallel turn, i.e., skis are maintained close and parallel to each other, a turn is initiated by unweighting the skis with a substantial uplift movement. It is a further object of the present invention to provide skis which will reduce the amount of effort necessary to unweight or afford uplift to the skis particularly when making parallel turns.

Briefly in review, objects of this invention are to provide improvements in skis whereby weight distribution can be adjusted so tip and tail pressures can be varied to afford improved tracking; weight can be adjusted longitudinally of the skis independent of the longitudinal bending rigidity; the ski will substantially conform to undulations of the terrain while maintaining weight distribution; means are provided whereby indicia can be supplied on the skis to generally indicate the position of adjustment of the skis without requiring the user to mathematically compute the adjusted position of the parts; means are provided whereby the skis can be readily unweighted to particularly adapt the ski for parallel turns; the skis are provided with an adjustable torsion rigidity independent of the adjustable longitudinal rigidity; the skis are provided with a construction to obviate chattering caused by excessive vibration; adjustments of the skis can be made independently of built-in characteristics of the ski runners; and the parts can be readily assembled and disassembled for purposes of adjustment, replacement and repair.

These together with other and more specific objects and advantages will become apparent from the following description when taken in conjunction with the accompanying drawings forming a part thereof, wherein:

FIGURE 1 is a side elevation of the novel ski of the invention;

FIGURE 2 is a top plan view of FIGURE 1;

FIGURE 3 is a longitudinal section taken substantially on the plane of line 3—3 of FIGURE 1, and showing details of the torsion-control binding mounting;

FIGURE 4 is an enlarged vertical section on the plane of line 4—4 of FIGURE 1, showing details of a preferred construction;

FIGURE 5 is a side elevation of a conventional ski, and showing by solid lines the attitude of the ski when the tail is unweighted;

FIGURE 6 is an elevation of the ski of the invention, showing the general position of the parts when the tail is unweighted;

FIGURE 7 is a perspective view of a ski when traversing the full line of a slope and generally subject to torsion due to edging of the ski, and showing how the ski generally conforms to a compound curve on the slope and can be edged substantially along its entire length;

FIGURE 8 is a side elevation looking substantially from the plane of line 8—8 of FIGURE 7;

FIGURES 9—11 are side elevational views of a conventional ski and illustrating diagrammatically the attitude assumed by the ski when passing over an undulation in the terrain;

FIGURES 12—14 are side elevations similar to FIGURES 9—11, respectively, and illustrating diagrammatically the position assumed by the ski of the invention when passing over similar terrain conditions;

FIGURE 15 is an enlarged fragmentary side elevation of the foremost mounting block of the ski of FIGURE 14; and

FIGURE 16 is a perspective view of one of the mounting blocks and retainer removed from the ski.

Referring to the drawings in detail, and first considering FIGURES 1—4, 15 and 16, the novel ski is indicated generally at 10 and comprises a runner 12, having secured thereto by means of forward and rear mounting block assemblies 14, 16, 18, 20, 26 and 28 which will accommodate thereon suitable ski bindings to which a boot 32 will be attached.

The ski 12 comprises an elongated runner 34 manufactured from epoxy resins, fiber glass, aluminum, etc., as well as wood or combinations thereof in order to afford the degree of flexibility and strength. The supports will likewise be constructed from any suitable material. The mounting block assemblies 14, 16, 18, 20, 26 and 28 are substantially the same except for variations which will affect torque control characteristics.
Referring to FIGURES 15 and 16, a typical mounting block detail shows a plurality of depending, U-shaped loop-forming wire elements 36 which have lateral ends 38 thereof embedded in the support 22, for example. The ski runner 34 has extending upwardly therefrom inverted, loop-forming U-shaped wire elements 40 having lateral ends 42 embedded in the runner 34. The plastically received between the wire elements 36 and 40 are resilient blocks 44 of rubber, etc. The blocks can be withdrawn from between the elements 36 and 40 for purposes of replacement, repair and adjustment. The support 22 can be shifted longitudinally with respect to the runner 34 by unlocking and movement of the blocks 44. Referring to FIGURE 3, it will be noted that block 44 is of a width which is less than the width of block 44' of the mounting block assembly 16. In the mounting block assemblies 18 and 20, the blocks 44" and 44' are respectively graduated in width, and thus it will be observed that the blocks 44"-44' are graduated in width from the rear to front of the ski runner 34. The blocks 44"-44 can also be graduated in length; see phantom lines 45, 45', 45" and 45'" respectively. The different mounting assemblies at the sides of the blocks 44"-44' can be filled with foam rubber blocks 46, see FIGURE 4, for preventing snow from accumulating between the ski runners and supports.

Considering FIGURES 7 and 8, the ski is indicated as moving down the fall line of a slope where the contour changes and presents a compound curve. The uphill edge 48 of the ski runner 34 is edged by the skier by pressing the knees into the slope. The skis are subject to torque, and due to the graduated resilient blocks, i.e., widthwise or lengthwise, as the skier applies lateral pressure to the flexible ski, i.e., presses the edge into the slope to edge the ski, the edge 48 will be twisted to conform to the compound curve of the slope; note edge portions 48 and 48' of the uphill ski edge. The ability of the ski runner and edge to substantially conform to the curve over which the runner traverses affects the skier greater control, i.e., greater edge contact across a hill crown, than afforded by conventional skis. Conventional skis, since they have a uniform twist or torque responsive action when encountering a compound curve will generally be in tangential relation to the fall line or crown of a hill at curve changes and thus edge engagement or control by the skier is limited at curvature changes when using conventional skis.

Additionally, since the novel skis conform at the edges to compound curves, there will be minimum of chattering of the ski due to loss of edge contact.

The presently preferred form of the ski will result in the skier's boot being positioned somewhat higher than conventional skis; however, this is not objectionable, and as a practical matter, positions the relatively wide boot slightly higher than in conventional skis to thus reduce resistance to movement through deep snow when using the invention.

Referring to FIGURES 9-11, a conventional ski, which would include a relatively high or stiff longitudinal bending rigidity is indicated at 100 and the positions assumed by the runner passing over an obstacle O are illustrated diagrammatically. In FIGURE 9, the tip 102 of the ski is above the running surface due to the stiffness of the ski. This results in poor tracking and is not particularly desirable especially in deep powder snow.

In FIGURE 10, when the intermediate portion of the runner is over the obstacle O, the tip 102 and tail 104 of the ski can be edged while in FIGURE 9 only the tail 104 can be edged. In FIGURE 11, only the tip 102 is edged as tail 104 passes over the obstacle.

Referring to FIGURES 1-4, 6-8 and 12-14, the relatively flexible runner 34 will afford contact or tracking at both the tip 35 and tail 37, as will be noted from FIGURES 12-14 as compared with FIGURES 9-11, respectively; see relative position of these parts with respect to obstacle O.

The spacers 44'-44" when varied in length will affect the rigidity of the supports 22 and 24 as well as the torque characteristics. The supports 22 and 24 although being stiff, will be sufficiently flexible to afford the rhythmic uplift so closely identified with parallel skiing or during "weddeln." Thus, the application of a slight upward movement, or shifting of the skier's weight; see FIGURE 6, followed by an upward movement of the skier, i.e., raising at the knees, causes the tail 37 to have a free uplift to utilize the kinetic energy of the skier's weight imparting movement of the supports 22 and 24. Note, for example, FIGURE 5, where conventional or a conventional ski is illustrated, and the unweighting of the tail 104 is shown by solid lines. The arched supports 22, 24 and 30 combine to afford, in effect, a spring action similar to that afforded by a trampoline where the participant is jumping upwardly and moving downwardly in rhythm or in time with the movement of the trampoline springs or canvas.

Although the runner 34 is illustrated as being flexible and affording considerable edge contact and tracking, it will be observed that the uplift afforded by normal ski camber or stiffness is not lost. The amount of stiffness of the supports can be adjusted by longitudinal positioning of the spacer blocks 44'-44". Unlike conventional skis, where the weight is distributed on the tip and tail in relation to the location of the ski binding, i.e., location of the skier's weight, the present invention contemplates a more uniform distribution of weight through the use of four mounting assemblies 12-18 spaced longitudinally along the runner 34. When the skier's weight is received on support 30, weight is applied to the supports 22 and 24, and the load is then shared or distributed to points 14, 16 and 18, 20. As previously mentioned, all of the supports are adjustable longitudinally with respect to each other and the runners, i.e., the weight distribution of the skier can be adjusted independently of the camber or stiffness rigidity of the ski.

The skis and supports can be provided with indexing indiaca (not shown) to compensate for different types of snow, skier weights, tracking characteristics in order to permit the individual to make his own adjustments. The various positions of the parts will have been previously determined empirically and the skier will not have to make computations prior to adjusting his skis.

Thus there has been disclosed novel skis which afford maximum tracking, improved edge control, responsive edging, and generally versatile skiing on a packed base as well as on deep powder, and skis which fully conform with the objects of the invention and advantages recognized by those skilled in the art.

It is understood that this invention is not confined to the particular embodiment shown and described, the same being merely illustrative, and that this invention may be carried out in other ways within the scope of the appended claims without departing from the spirit of the invention as it is obvious to those skilled in the art that the particular embodiment shown and described is only one of the many that may be employed to attain the express and implied objects of the invention.

I claim:

1. A single ski-runner construction for use on an individual's foot on ice or snow comprising an elongated, flat and flexible runner having a substantially greater transverse width than vertical width, by which construction, a pair of elongated supports overlying said runner and disposed in longitudinally spaced relation thereon between the side margins of said runner, mounting means securing terminal ends of said supports to intermediate portions of said runner, and a third, elongated support overlying said pair of supports and said runner disposed between the side margins thereof, mounting means securing terminal ends of said third support to interme-
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diate portions of said pair of supports, said third support including an intermediate upper boot-binding receiving portion for receiving a ski-boot thereon and permitting the skier to impose "edging" substantially over the entire "down-hill" edge of the ski runner by imposing transverse torque to said third support.
2. A ski construction as claimed in claim 1 in which at least said pair of supports are bowed upwardly from said runner.

3. A ski construction as claimed in claim 1 in which said mounting means includes cooperating portions adjustably securing said pair of supports for longitudinal adjustment with respect to said runner.
4. A ski construction as claimed in claim 3 in which at least said pair of supports are bowed upwardly from said runner.
5. A ski construction as claimed in claim 1 in which said runner is flexible both longitudinally and transversely for conforming to compound curves to provide edging substantially along the entire length of said runner.
6. A ski construction as claimed in claim 5 in which said supports are concave-convex.
7. A ski construction as claimed in claim 5 in which said mounting means comprises a plurality of aligned loop-forming elements on at least said pair of said supports and said runner, and an elongated block extending through said aligned loop-forming elements for retaining the pair of supports on said runner.
8. A ski construction as claimed in claim 5 in which said mounting means comprise a mounting block interposed between terminal ends of said pair of supports and said runner, said mounting blocks being graduated widthwise progressively from a tail to tip portion of said ski.
9. The structure of claim 5 in which said mounting means comprises a mounting block interposed between said pair of supports, adjacent mounting blocks differing in size for affording different torque and bending characteristics.

10. A ski construction comprising an elongated flat and flexible ski runner having a tail and tip portion, a pair of elongated supports overlying said runner and disposed in longitudinally spaced relation thereon, mounting means securing terminal ends of said supports to intermediate portions of said runner, and a third, elongated support overlying said pair of supports and said runner, mounting means securing terminal ends of said third support to intermediate portions of said pair of supports, said mounting means for said pair of supports comprising mounting blocks interposed between the terminal ends of said supports and graduated in size progressively from one end of said runner to the other.
11. A ski construction as claimed in claim 10 in which said mounting blocks comprise a resilient material.
12. A ski construction as claimed in claim 10 in which said ski has packing means filling the space between said runners and said supports adjacent said blocks for preventing snow from impacting therebeneath.

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