US 20060163826A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0163826 A1**

Huntimer et al. (43) **Pub. Date: Jul. 27, 2006**

(54) **SNOWMOBILE SKI WITH INCREASED STABILITY**

(76) Inventors: **Todd M. Huntimer**, Arlington, SD (US); **Jody L. Lemme**, Arlington, SD (US); **Daniel B. Palli**, Nunda, SD (US)

Correspondence Address:
BLACK LOWE & GRAHAM, PLLC
701 FIFTH AVENUE
SUITE 4800
SEATTLE, WA 98104 (US)

(21) Appl. No.: **11/041,668**

(22) Filed: **Jan. 24, 2005**

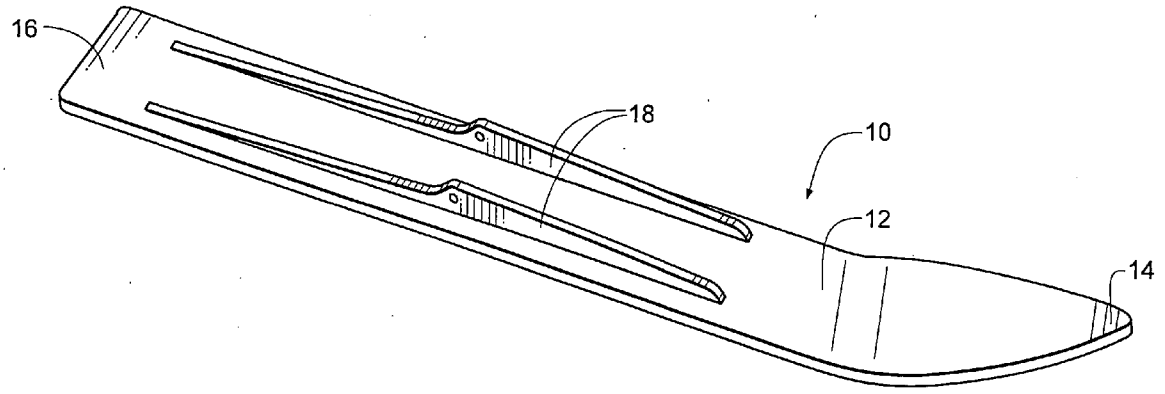
Publication Classification

(51) **Int. Cl.**
A63C 1/30 (2006.01)

(52) **U.S. Cl.** **280/11.18**

(57) **ABSTRACT**

A snowmobile ski having improved turn stability. The ski includes a lower surface for sliding contact with snow, the lower surface being configured with at least one longitudinally extending, downwardly open groove having an internal cross-section dimension that diminishes rearwardly to thereby progressively constrict the groove. The groove is open forwardly to receive snow within it and is open rearwardly to enable snow to exit from the groove. Snow received within the groove becomes packed when such snow encounters the progressively constricted portions of the groove as the ski slides forwardly on a snowy surface.



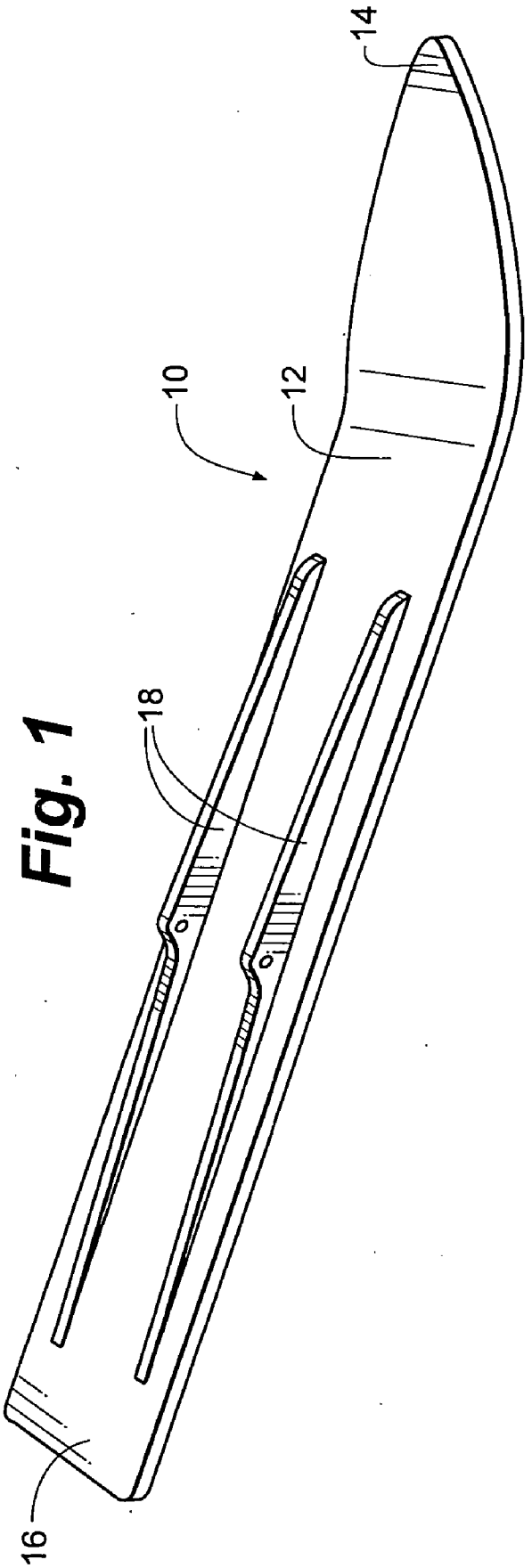


Fig. 1

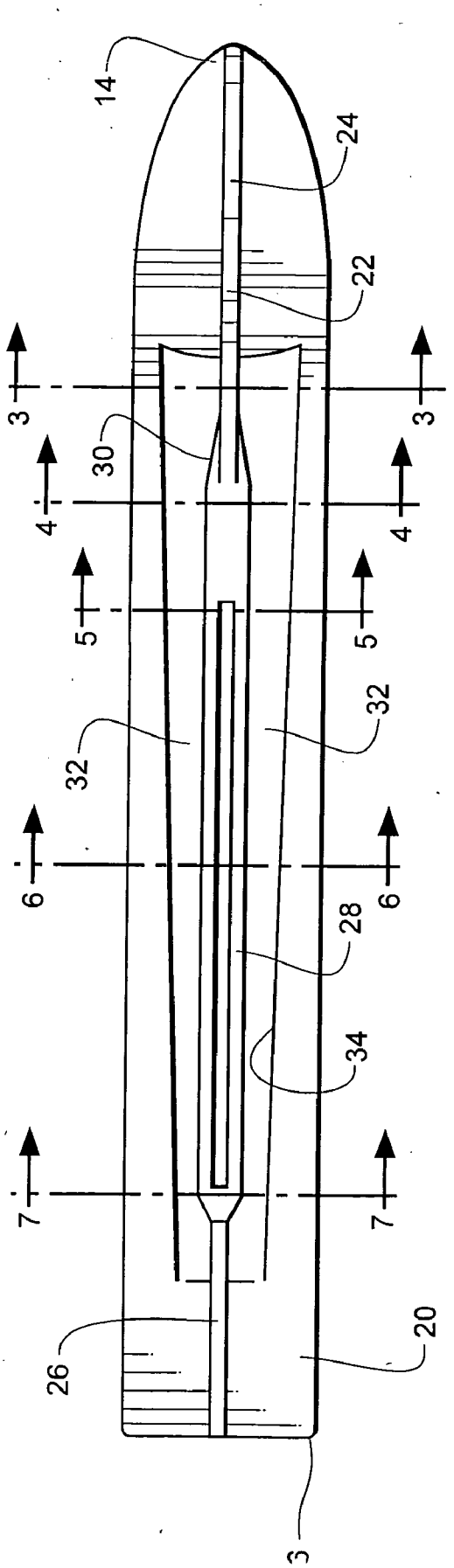


Fig. 2

Fig. 3

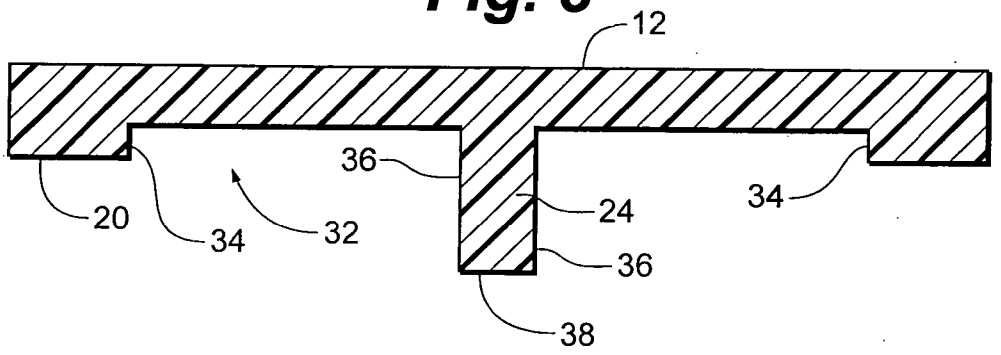


Fig. 4

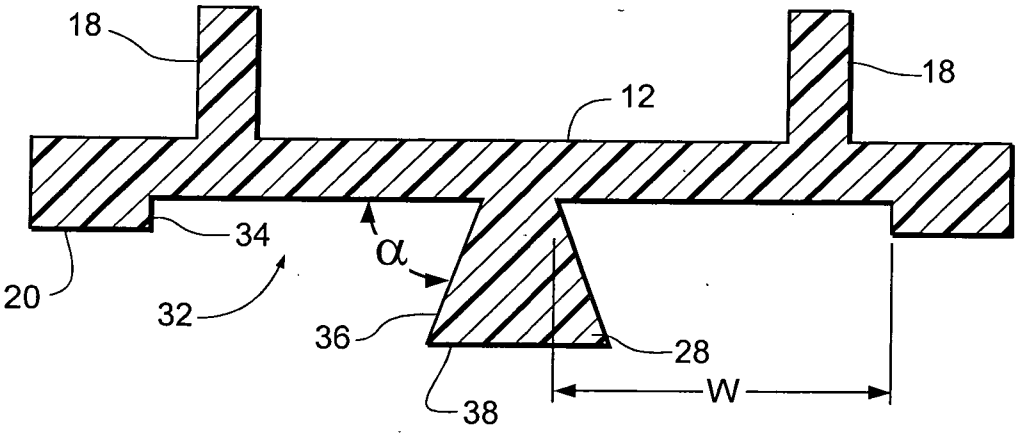


Fig. 5

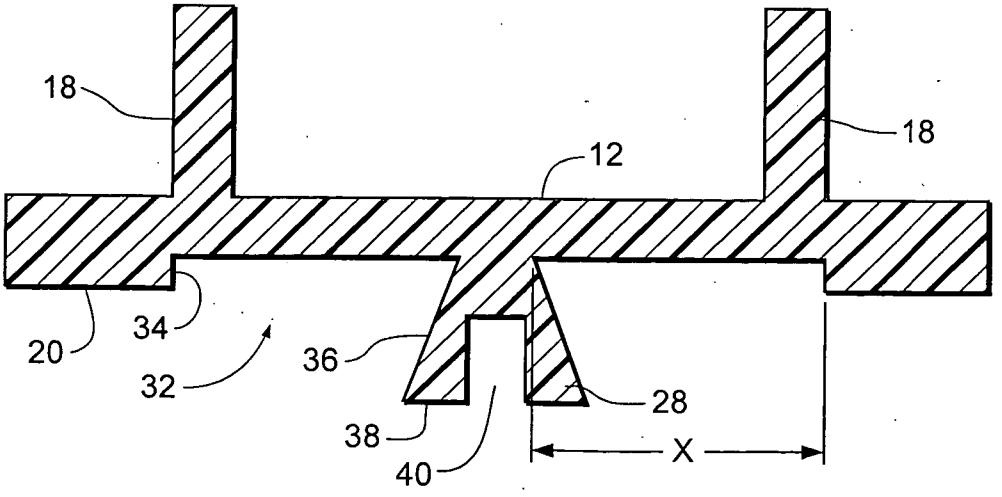


Fig. 6

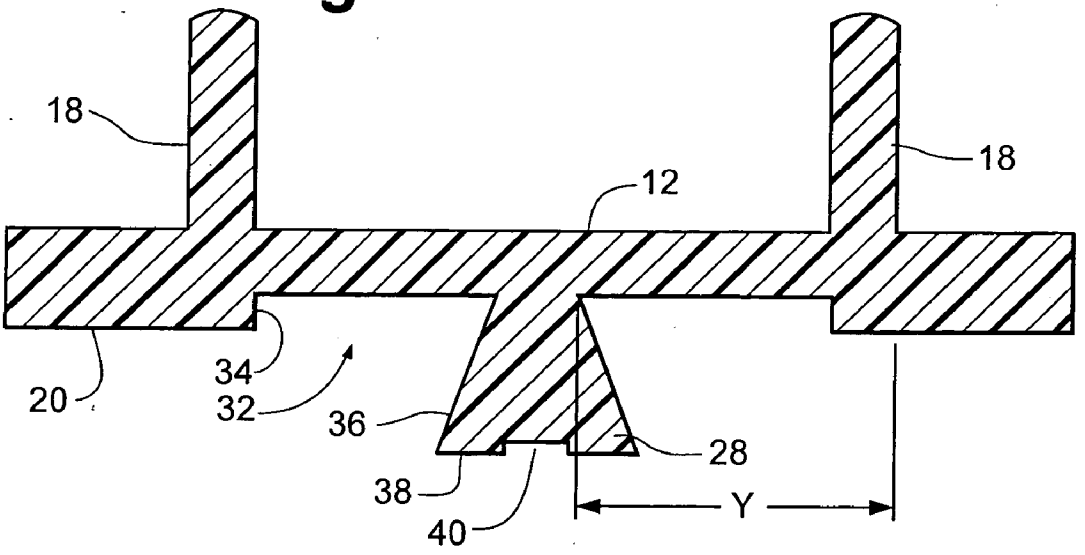
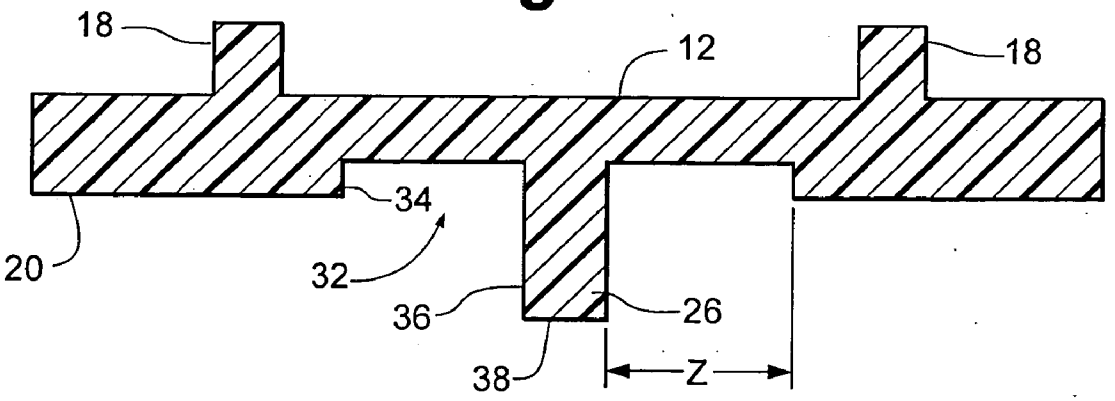


Fig. 7



SNOWMOBILE SKI WITH INCREASED STABILITY

FIELD OF THE INVENTION

[0001] The invention pertains to snowmobile skis and more particularly to skis that have enhanced turning stability.

BACKGROUND OF THE INVENTION

[0002] As a snowmobile or other ski slides through snow, turning of the ski promotes sideways slippage in a manner that is well known to downhill skiers and snowmobilers. In downhill skiing, a certain amount of side slip is desirable to enable the skis to be orientated as turns are made. Here, side slippage is controlled by causing the edges of the skis to bite into the snow in a controlled manner.

[0003] In contrast, side slippage of snowmobile skis is to be avoided. Snowmobile skis desirably bite into the snow surface and resist sidewards slippage as much as possible. One way of promoting this function is to configure the bottom, snow-contacting surface of a ski so that it contains one or more longitudinally extending, downwardly protruding ribs, the ribs having as their purpose the reduction of side slip by biting into the snow being traversed.

[0004] In general, as a snowmobile ski is turned and begins to slip sideways, snow at the outer portion of the ski is pushed sideways and as a result the snow surface is fractured to some extent. The use of longitudinally extending bottom ribs to some extent promotes stability by digging into the snow, but better stability is to be desired. Excessive sideslip can be avoided, of course, by going slow, but as a rule, slow speeds are not appealing to snowmobilers.

SUMMARY OF THE INVENTION

[0005] The present invention employs a unique configuration of the lower sliding surface of a snowmobile ski to promote stability, particularly during turns. Broadly speaking, snowmobile skis may be provided with a lower surface having a longitudinal groove or channel that tapers from front to rear, becoming smaller in cross-section toward the rear. Snow entering the front of the channel thus is compressed as the ski slides forwardly and the snow in the channel encounters smaller channel cross sections. This, in turn, causes snow within the channel to pack or compress and to thus "harden" the snow in the channel, providing a hardened ridge or rail of snow against which the ski presses, the packed and hardened snow ridge functioning to control side slip.

[0006] In one embodiment, the invention provides a snowmobile ski that comprises a generally ski-shaped body with a longitudinal axis and forward and rearward ends, the ski having a lower surface for sliding contact with snow. The lower surface is configured with at least one longitudinally extending, downwardly open groove having an internal cross-section dimension that diminishes rearwardly, to thereby progressively constrict the groove rearwardly. The groove is open forwardly to receive snow within it and is open rearwardly to enable snow to exit from the groove, whereby snow received within the groove becomes packed more tightly when such snow encounters progressively constricted portions of that groove as the ski slides forwardly on a snowy surface.

[0007] In another embodiment, the invention provides a snowmobile ski with a generally ski-shaped body and forward and rearward ends, the ski having the lower surface for a sliding contact with snow, the lower surface having a downwardly protruding, longitudinally extending rib positioned intermediate longitudinal edges of the ski. The lower ski surface is recessed to define longitudinally extending grooves on each side of the rib, each groove having an internal cross-section dimension that dimishes rearwardly to thereby progressively constrict the groove.

[0008] In a preferred embodiment, a snowmobile ski is provided that has a generally ski-shaped body with a longitudinal axis, forward and rearward ends, and a lower surface for sliding contact with snow, the lower surface having at least one longitudinally extending groove that opens forwardly and downwardly to receive snow as the ski slides forwardly. The groove has laterally spaced confronting sidewalls that converge rearwardly to cause snow within the groove to pack more tightly near the rearward end of the groove as the ski slides forwardly on a snowy surface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] **FIG. 1** is a perspective view of a snowmobile ski of the invention, showing particularly it's a upper surface;

[0010] **FIG. 2** is a bottom view of the ski of **FIG. 1**, showing details in bottom surface configuration;

[0011] **FIG. 3** is a schematic cross-sectional view taken along line **3-3** of **FIG. 2**;

[0012] **FIG. 4** is a schematic cross-sectional view taken along line **4-4** of **FIG. 2**;

[0013] **FIG. 5** is a schematic, cross-sectional view taken along line **5-5** of **FIG. 2**;

[0014] **FIG. 6** is a schematic, cross-sectional view taken along line **6-6** of **FIG. 2**; and

[0015] **FIG. 7** is a schematic, cross-section view taken along line **7-7** of **FIG. 2**.

DETAILED DESCRIPTION

[0016] Referring first to **FIGS. 1 and 2**, **FIG. 1** shows a snowmobile ski having a generally ski-shaped body **10**; i.e., a body elongated in the direction of travel, the body having an upper surface **12**, a raised tapered forward end **14** and a rearward end **16**. Upwardly extending connectors **18** are employed in the usual fashion to attach to the suspension system of snowmobile. With reference to the bottom surface of the ski, "longitudinal", as used herein, refers to the long direction of the ski as it rests on the ground, that is, the direction of travel of the ski, whereas "lateral" or "transverse" refers to a direction across the width of the bottom surface of the ski that is normal to the longitudinal direction.

[0017] Referring to **FIG. 2**, the bottom surface of the ski is shown at **20**. Extending longitudinally along the length of the bottom surface **20** is a rib **22** which, in the exemplified embodiment, have front end and rear end portions **24**, **26** that are generally rectangular in cross-section. In this embodiment, the rib is positioned intermediate the side edges of the ski, preferably equidistant from the side edges. Extending between the forward and rearward rib portions is an intermediate rib portion **28**, this portion being joined to the

forward portion **24** by a tapered rib leading section **30**. Formed on each side of the rib portion **28** is a groove **32**, the later desirably extending for at least the length of the intermediate portion **28** of the rib, and preferably extending for a short distance forwardly and rearwardly of the rib portion **28**, as shown best in **FIG. 2**. The intermediate rib portion **28** preferably extends for the majority of the longitudinal length of the ski, and desirably is positioned at least beneath the primary weight bearing intermediate portion of the ski.

[**0018**] The structure of the rib and grooves can perhaps be best understood with reference to **FIGS. 3-7**, which represent cross-sections of the ski taken at different positions along the ski length. As the ski slides forwardly on a snowy surface, the generally rectangular front rib portion **24** provides for the gradual entrance into the snow of the intermediate portion **28** of the rib. Note that although the schematic cross-section **FIGS. 3-7** are shown with sharp edges, in practice, the edges desirably are rounded slightly.

[**0019**] Referring now to **FIG. 3**, this cross-section is taken on line **3-3** of **FIG. 2**, that is, just forward of the tapered rib leading portion **30**. The groove **32** is defined by sidewalls **34**, **36**. Sidewalls **34** extend upwardly from the bottom surface **20** of the ski, and may be referred to herein sometimes as outer sidewalls. Sidewalls **36** are provided by the outer surfaces of the rib **26** that confront the respective outer sidewalls **34**, and are sometimes referred to herein as inner sidewalls. In this **FIG. 3**, the sidewalls **36** are generally vertical.

[**0020**] **FIG. 4** schematically shows a cross-section of the ski along line **4-4** of **FIG. 2**, that is, at approximately the rear of the tapered leading rib portion **30** and at the forward end of the intermediate rib portion **28**. The bottom surface **38** of the rib expands laterally in width downwardly, as shown **FIG. 4**, the rib here taking on a generally dovetail configuration with its sidewall **36** facing an outer sidewall tapering downwardly and outwardly toward the outer sidewall at an angle a to the horizontal. This angle may be set as desired, and values in the 75 degree range have been found appropriate. The width W of the groove may, in this cross section, be generally the same or perhaps slightly less than the width of that groove in the cross section of **FIG. 3**.

[**0021**] The schematic cross section of **FIG. 5** is taken along line **5-5** of **FIG. 2**, that is, at a point spaced rearwardly of the cross-section of **FIG. 4**. In **FIGS. 3-7**, it will be noted that the inner sidewalls **36** are generally parallel and that each of the outer sidewalls **34** converge gradually rearwardly with the respective confronting inner sidewall **36** provided by the rib, such that the lateral, that is, transverse, width of the groove diminishes rearwardly. Compare, for example, the width W in **FIG. 4** with the width X in **FIG. 5**, the width Y in **FIG. 6**, and the width Z in **FIG. 7**. If desired, the outer sidewalls **34** may be made generally parallel, and the confronting inner sidewalls **36** provided by the rib may diverge rearwardly so that the lateral width of the groove **32** diminishes rearwardly. Also, if desired, the outer sidewalls **34** may be convergent rearwardly and the inner sidewalls **36** may be divergent rearwardly so that the lateral width of the groove **32** diminishes rearwardly.

[**0022**] In **FIG. 5**, a groove **40** is formed upwardly in the bottom surface **38** of the rib. The groove **40** may receive a skeg, that is, an elongated metal rod that extends downwardly beyond the bottom surface **38** of the rib and that serves to protect the bottom of the ski when riding over abrasive surfaces such as roadways that have been cleared of snow.

[**0023**] The schematic cross-section of **FIG. 6** is taken along line **6-6** of **FIG. 2**. As shown here, the groove **40** at the bottom of the rib **28** has become shallower, but more importantly the width of the groove **32**, designated Y in this Figure, has become progressively smaller as compared with the widths W and X of **FIGS. 4 and 5**.

[**0024**] **FIG. 7** is a schematic cross-sectional area taken along line **7-7** of **FIG. 2**, that is, just to the rear of the intermediate portion **28** of the rib. The inner walls **36** provided by the rib have again become generally vertical. The lateral width of the groove **32**, shown in this figure as Z, has diminished further in comparison with the width Y shown in the cross section of **FIG. 6**. Thus, throughout at least a substantial portion of the length of at least the intermediate portion of the rib, an internal cross-section dimension of the groove, typified as its lateral width, diminishes rearwardly to thereby progressively constrict the groove.

[**0025**] If desired, the height of the groove **32** above the lower ski surface **28** can be varied to progressively rearwardly constrict the groove, and, of course, the rib itself can be varied in cross-section as desired to provide an internal cross-section dimension, e.g., lateral groove width, that diminishes rearwardly of the ski. However, the height of the groove **32** above the lower surface **20** of the ski desirably is kept fairly uniform for ease of manufacture. Moreover, although the groove **32** is shown in the drawing as having a generally flat upper surface, the groove can be configured as desired, e.g., the upper surface of the groove may be made arcuate to present a generally concave or convex surface downwardly.

[**0026**] The ski itself desirably is molded in a one-piece from a polyolefin such as polyethylene, high molecular weight polyethylene, or ultra high molecular weight polyethylene ("UHMWPE"). If desired, the upper portion of the ski may be molded from one polyolefin, and the lower portion of the ski from another polyolefin. For example, the upper portion of the ski may be of low-density polyethylene and the bottom portion of the ski of UHMWPE. If desired, the ski may be made of a variety of other materials, including other polymers, metals and the like.

[**0027**] Ultra high molecular weight polyethylene is preferred, at least for the snow contacting portions of the ski, and appropriate molding methods are employed to assure good results. In the molding process, UHMWPE particles, commonly in flake form, are introduced into an appropriately configured mold. The mold is closed and pressure in the range of about 1200 to about 2000 psi, preferably about 1500 psi, are applied to the mold contents as the temperature is raised. The mold is heated to molding temperatures in the range of about 300° F. to about 400° F., preferably about 375° F., the pressure being controlled carefully while the mold is at a temperature within about 25° F. of its highest molding temperature. As the temperature of the mold is increased to cause fusion of the UHMWPE particles, followed by cooling of the mold, volumetric changes in the resin require adjustment of the molding conditions in order to maintain the desired pressure. This can be accomplished

through the use of commercially available hydraulic servo-mechanisms. After cooling, the ski is removed from the mold, and flash, if any, is removed.

[0028] In use, as a snowmobile is driven across the snowy surface, snow is received within the forward portion of the groove **32** where the groove has the greatest cross-sectional dimension, i.e., the greatest lateral width. The snow, although remaining substantially stationary with respect to the line of travel of the ski, encounters progressively constricted portions of the groove, and the snow itself will become compacted so as to form a hardened track or rail of compacted snow. Downward compaction of the snow also occurs, of course, due to the weight of the snowmobile. It is believed that the compacted track or rail in this fashion, against which the walls of the groove may push in a transverse direction as the ski is turned, provides resistance to sideways slippage of the ski during a turn. Snow compaction in the groove also occurs as the inner, sloping sidewall **36** provided by the rib pushes sideways against snow during a turn. It may also be noted that the intermediate portion **28** of the rib extends downwardly beyond the plane joining the lower ski surfaces **20**, the rib here providing not only sidewalls against which snow can be compacted, but also downwardly extending portion that digs into the snow to provide added stability.

[0029] While a preferred embodiment of the invention has been described, it should be understood that various changes, adaptations and modifications may be made therein without departing from the spirit of the invention and the scope of the appended claims.

1. A snowmobile ski comprising a generally ski-shaped body with a longitudinal axis and forward and rearward ends and having a lower surface for sliding contact with snow, said lower surface being configured with at least one longitudinally extending, downwardly open groove having an internal cross-section dimension that diminishes rearwardly to thereby progressively constrict the groove, said groove being open forwardly to receive snow within it and open rearwardly to enable snow to exit from the groove, whereby snow received within said groove becomes packed when such snow encounters progressively constricted portions of that groove as the ski slides forwardly on a snowy surface.

2. A snowmobile ski comprising a generally ski-shaped body with a longitudinal axis and forward and rearward ends and having a lower surface for sliding contact with snow, said lower surface having a downwardly protruding, longitudinally extending rib positioned intermediate longitudinal edges of the ski, said lower surface being recessed to define longitudinally extending grooves on each side of at least a portion of said rib, each groove having an internal cross-section dimension that diminishes rearwardly to thereby progressively constrict the groove, each groove being open forwardly to receive snow within it, whereby snow received within a groove becomes packed more tightly when such snow encounters progressively constricted portions of that groove as the ski slides forwardly on a snowy surface.

3. A snowmobile ski comprising a generally ski-shaped body with a longitudinal axis and forward and rearward ends and having a lower surface for sliding contact with snow, said lower surface having at least one longitudinally extending groove that is open forward and downward to receive snow within it as the ski slides forwardly upon a snow surface, the groove having laterally spaced confronting side walls that converge rearwardly to cause snow within the groove to pack more tightly nearer the rearward end of the groove as the ski slides forwardly on a snowy surface.

4. The snowmobile of claim 3 wherein at least one of said side walls is undercut.

5. The snowmobile ski of claim 3 wherein said lower surface includes two of said longitudinally extending grooves, said grooves being generally parallel and laterally spaced from each other.

6. The snowmobile ski of claim 5 wherein said lower surface includes a downwardly protruding, longitudinally extending rib having walls defining inner side walls of said grooves with said grooves extending on each side of said rib.

7. The snowmobile ski of claim 6 wherein said rib is generally dove-tail shaped in cross section, the rib increasing in lateral width downwardly.

8. The snowmobile ski of claim 6 wherein one side wall of each groove is an outer side wall confronting a side wall provided by said rib.

9. The snowmobile ski of claim 8 wherein said outer side walls are convergent rearwardly toward respective confronting inner walls.

10. The snowmobile ski of claim 9 wherein said rib is substantially uniform in cross-section throughout the majority of its length.

11. The snowmobile ski of claim 10 wherein said rib is generally dove-tail shaped in cross section, the rib increasing in lateral width downwardly.

12. The snowmobile ski of claim 10 wherein said inner walls have a vertical height greater than said outer walls.

13. The snowmobile ski of claim 1 wherein said body is molded of a polyolefin.

14. The snowmobile ski of claim 13 wherein said polyolefin comprises an ultra high molecular weight polyethylene.

* * * * *