US 20020105166A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2002/0105166 A1**

Lemieux (43) **Pub. Date: Aug. 8, 2002**

(54) **SNOWMOBILE SKI**

(76) Inventor: **Rene Lemieux**, Granby (CA)

Correspondence Address:
PILLSBURY WINTHROP, LLP
P.O. BOX 10500
MCLEAN, VA 22102 (US)

(21) Appl. No.: **10/061,184**

(22) Filed: **Feb. 4, 2002**

Related U.S. Application Data

(60) Provisional application No. 60/265,632, filed on Feb. 2, 2001.

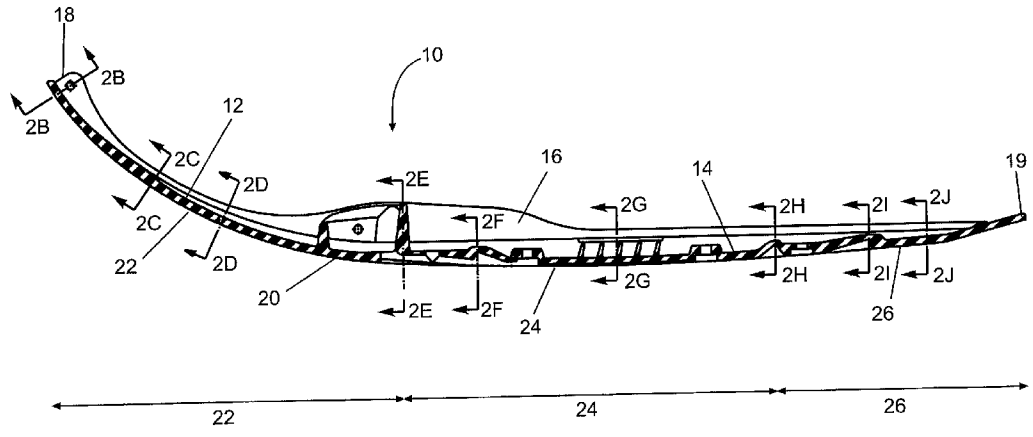
Publication Classification

(51) **Int. Cl.**[7] **A63C 5/04**

(52) **U.S. Cl.** **280/609**; 280/602

(57) **ABSTRACT**

A snowmobile ski includes a bridge portion adapted to connect to a ski leg of a snowmobile, a ski body having a top surface adapted to be connected to the bridge and a bottom surface adapted for moving over snow, the bottom surface having a front portion, a middle portion and a rear portion, a single keel running lengthwise exclusively along the middle portion and the rear portion of bottom surface of the ski body, and a runner provided on the keel.



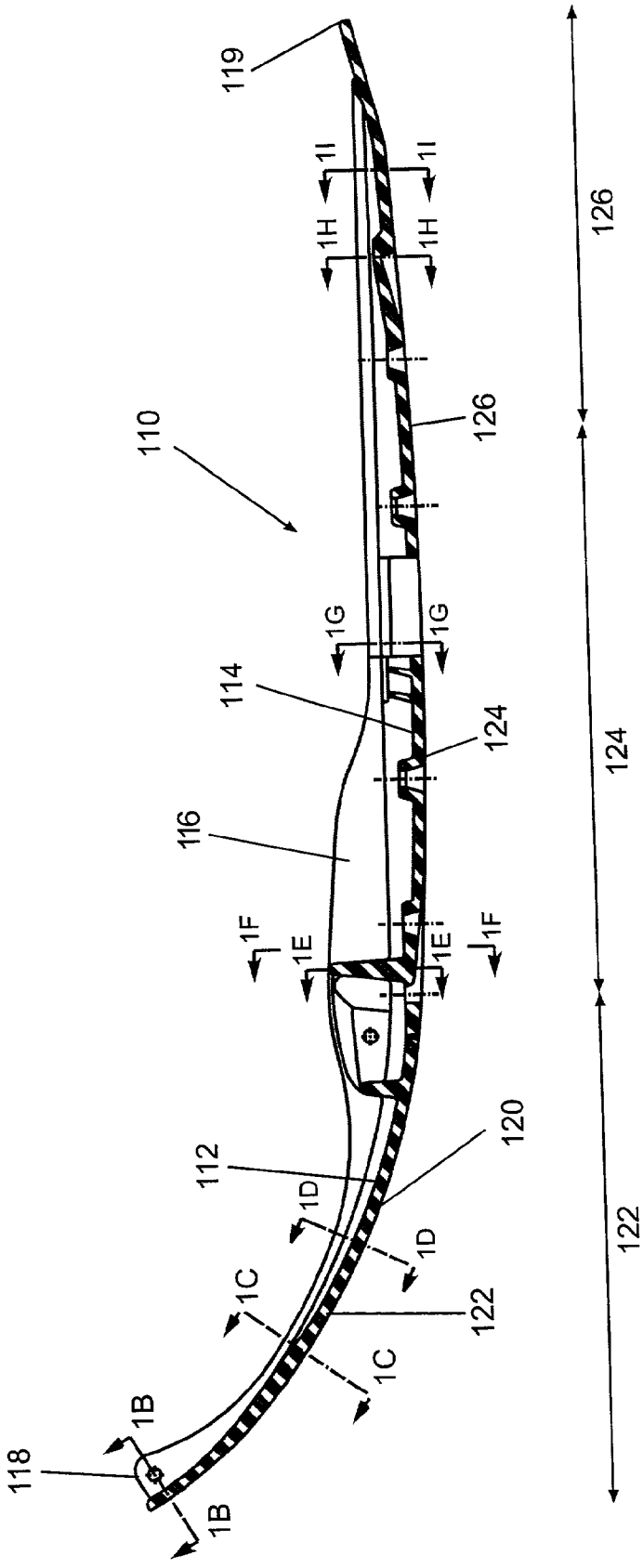


FIG. 1(A) Prior Art

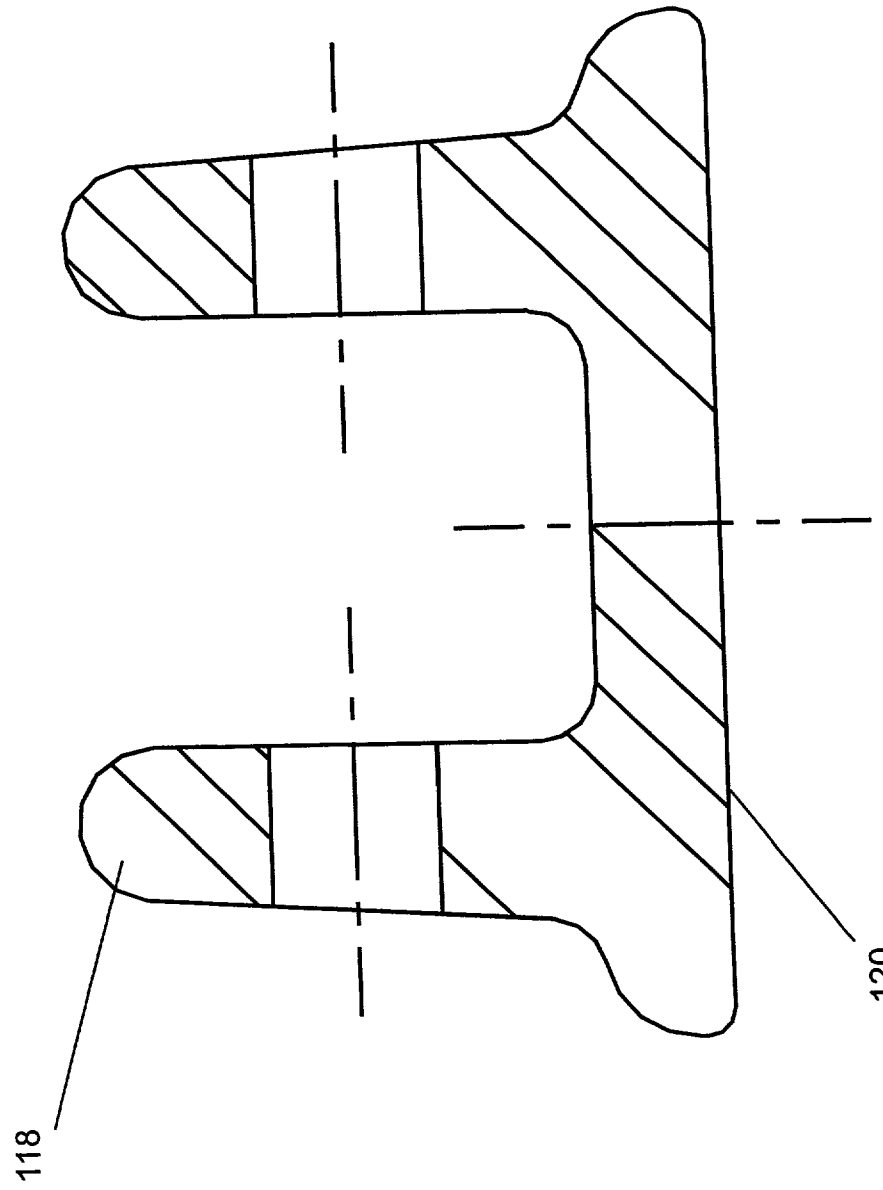


FIG. 1(B) Prior art

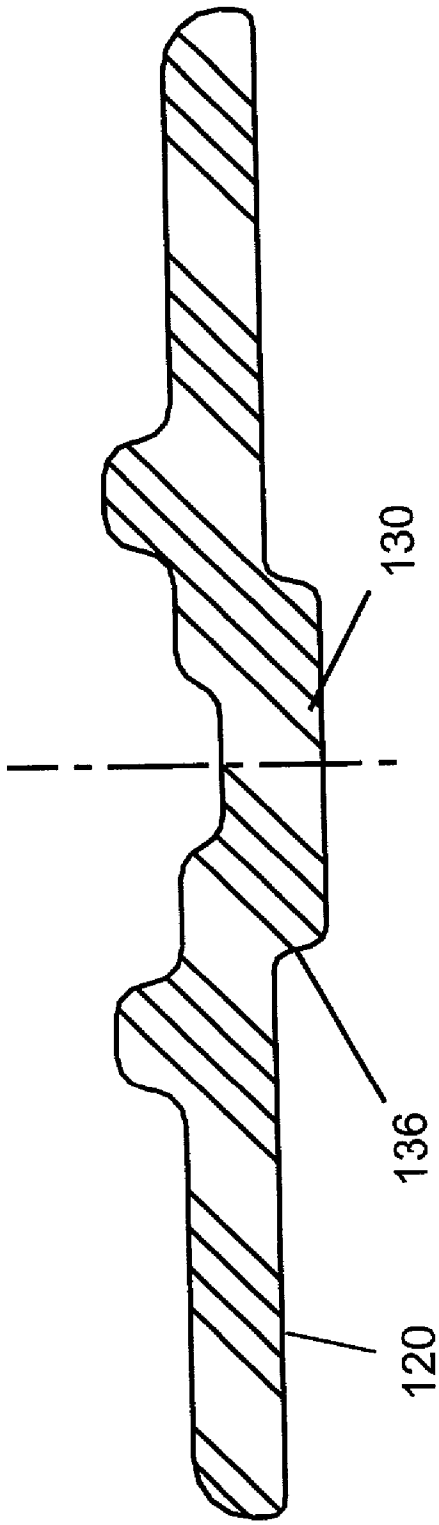


FIG. 1(C) Prior Art

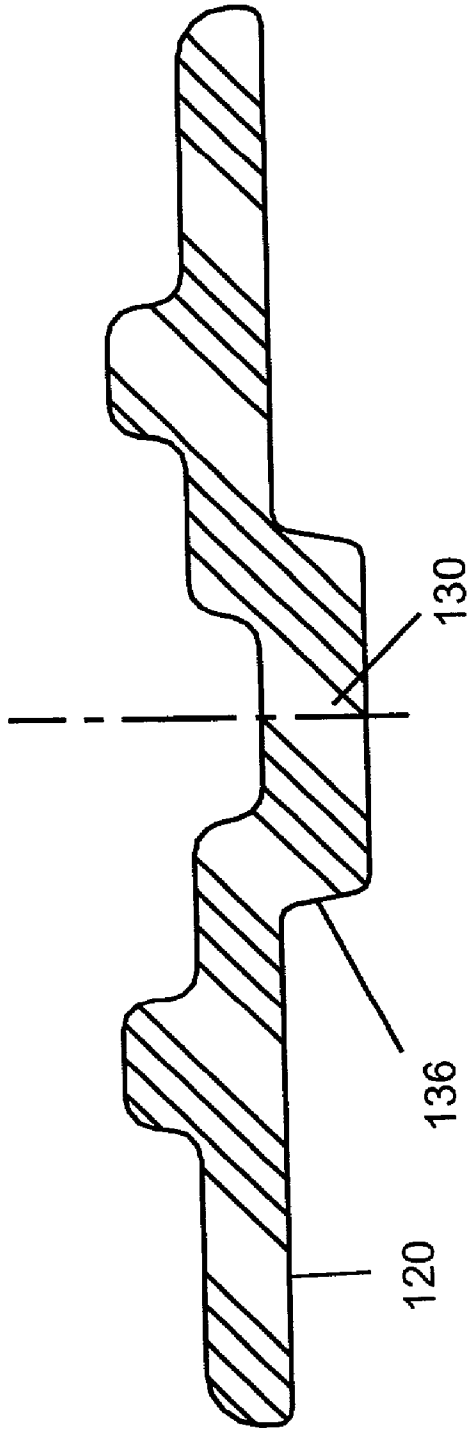


FIG. 1(D) Prior Art

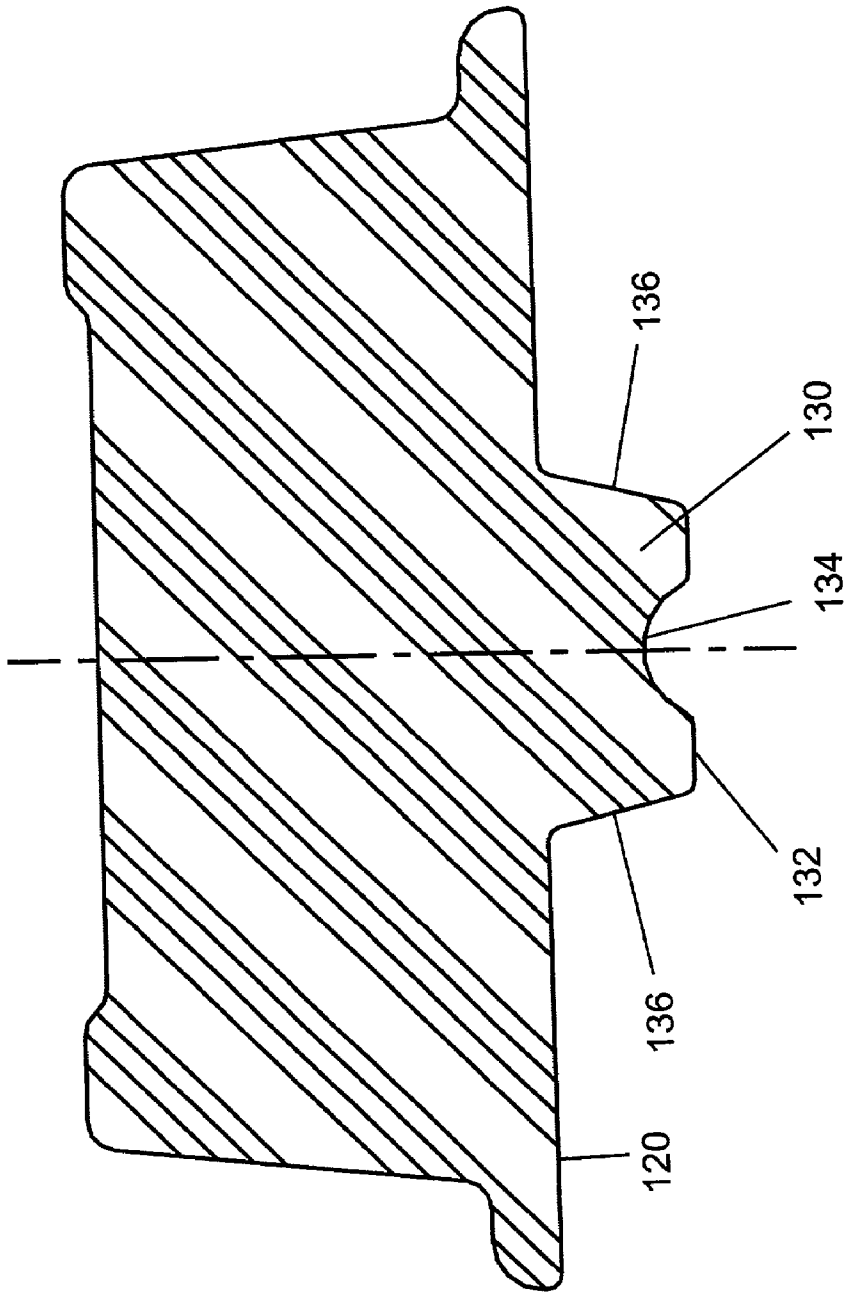


FIG. 1(E) Prior Art

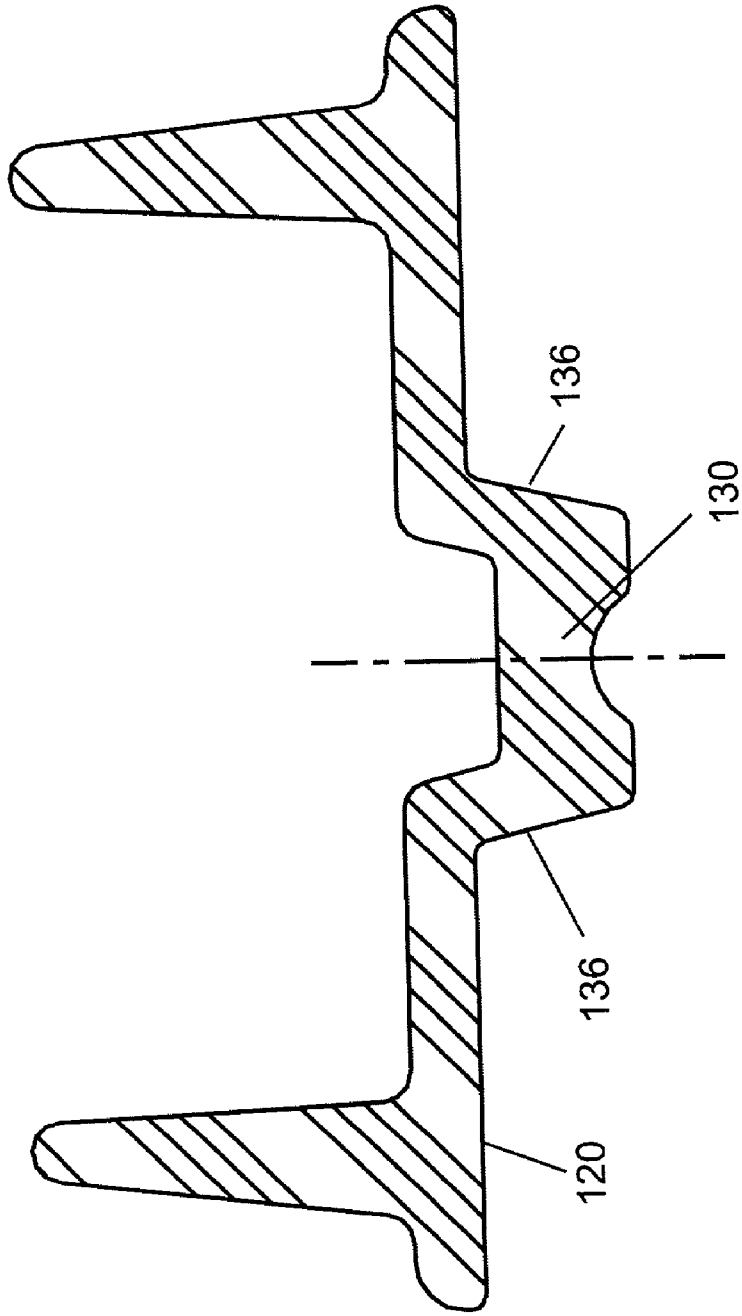


FIG. 1(F) Prior Art

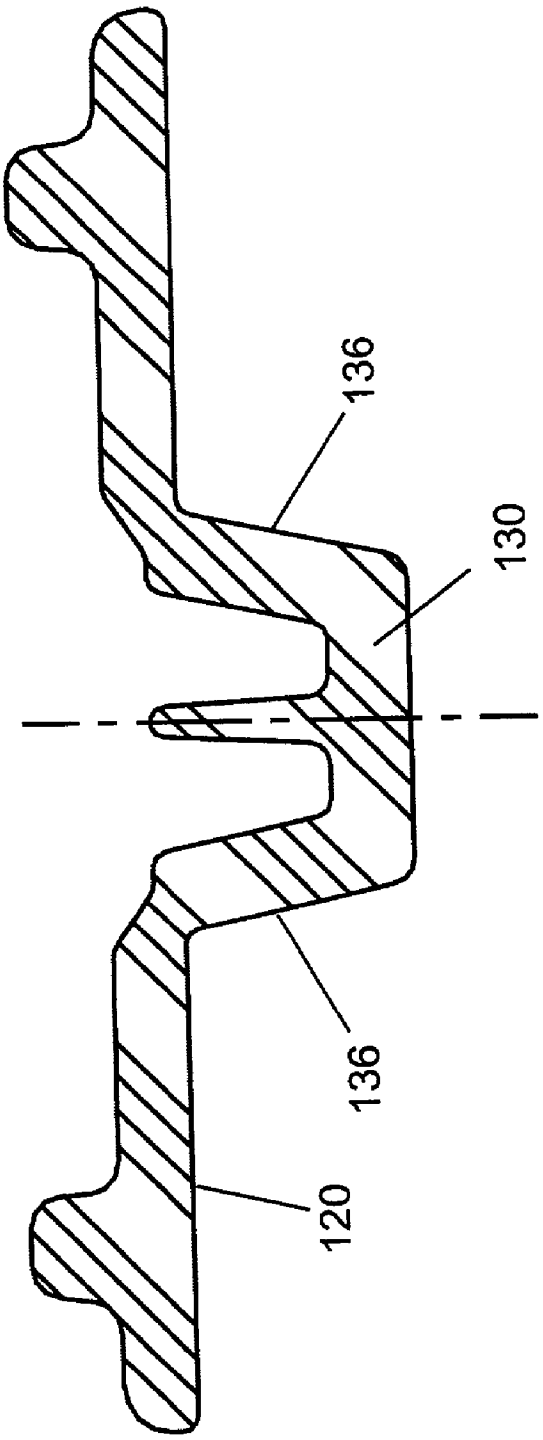


FIG. 1(G) Prior Art

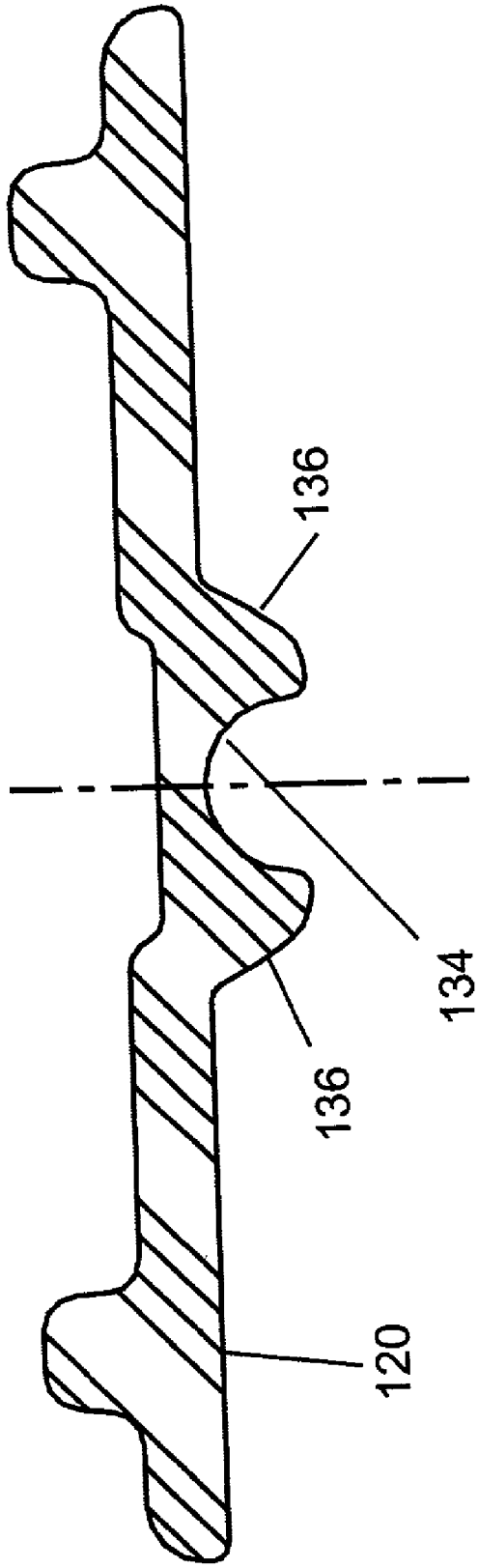


FIG. 1(H) Prior Art

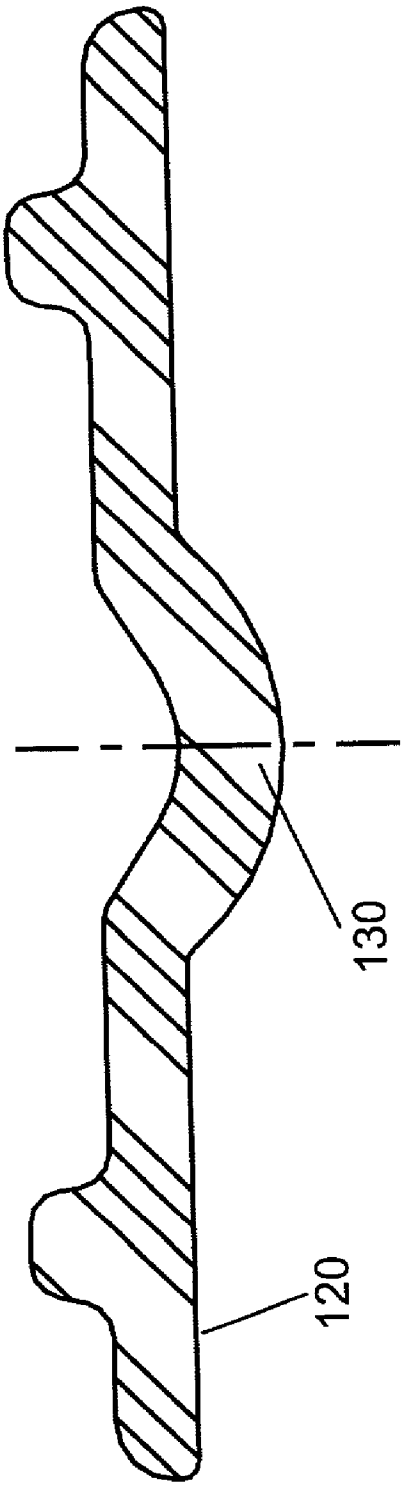


FIG. 1(I) Prior Art

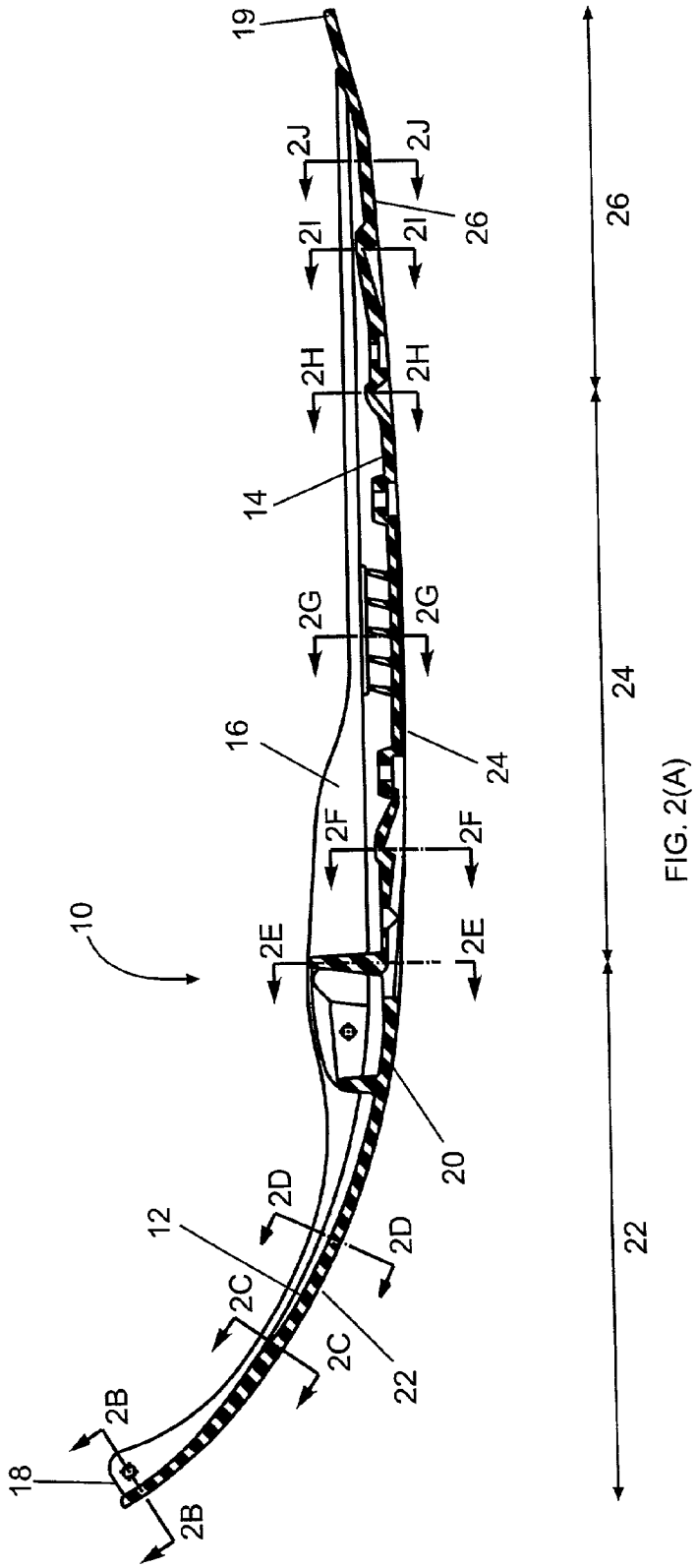

19
2J
2J
2I
2I
26
2H
2H
14
2G
2G
16
24
2F
2F
10
2E
2E
20
2D
2D
12
2C
2C
22
2B
18
2B
26
24
22

FIG. 2(A)

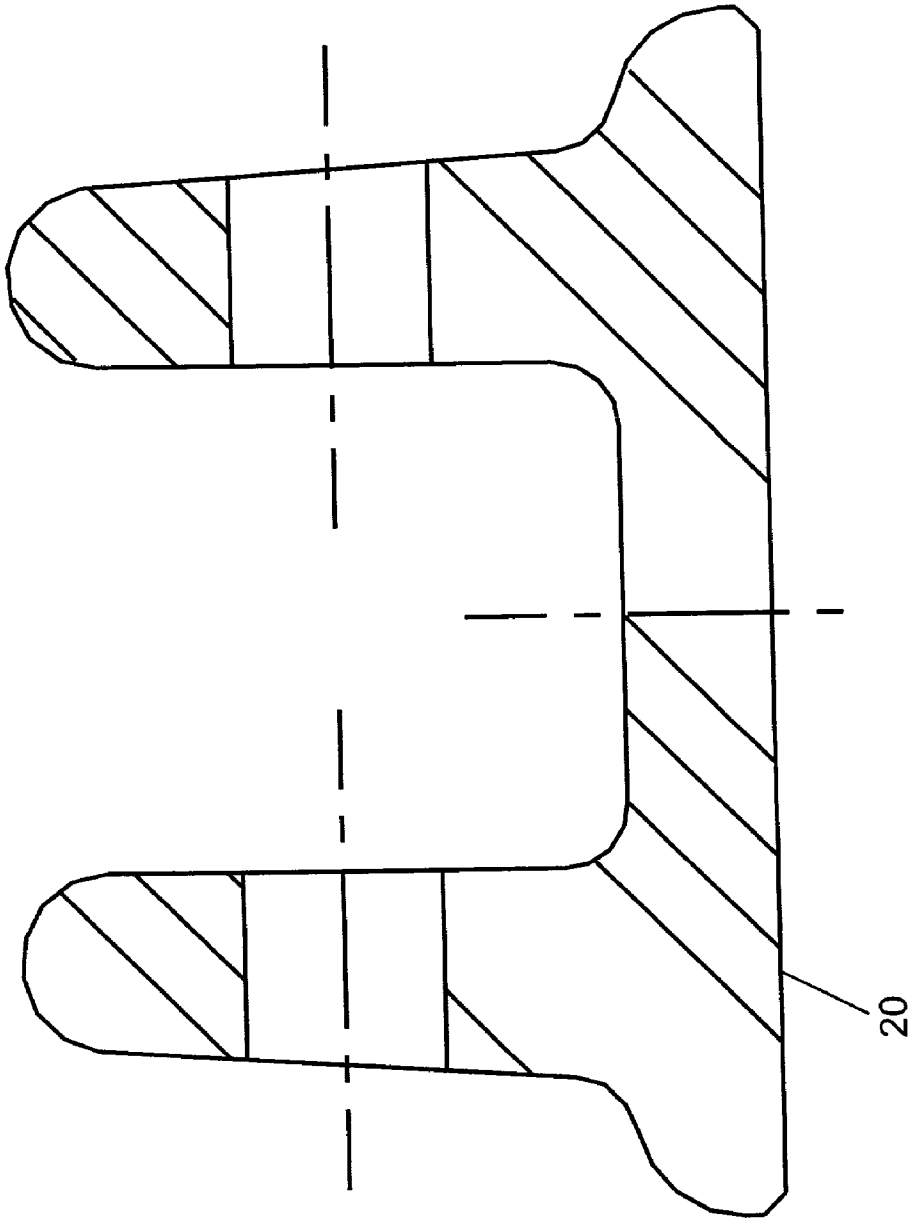


FIG. 2(B)

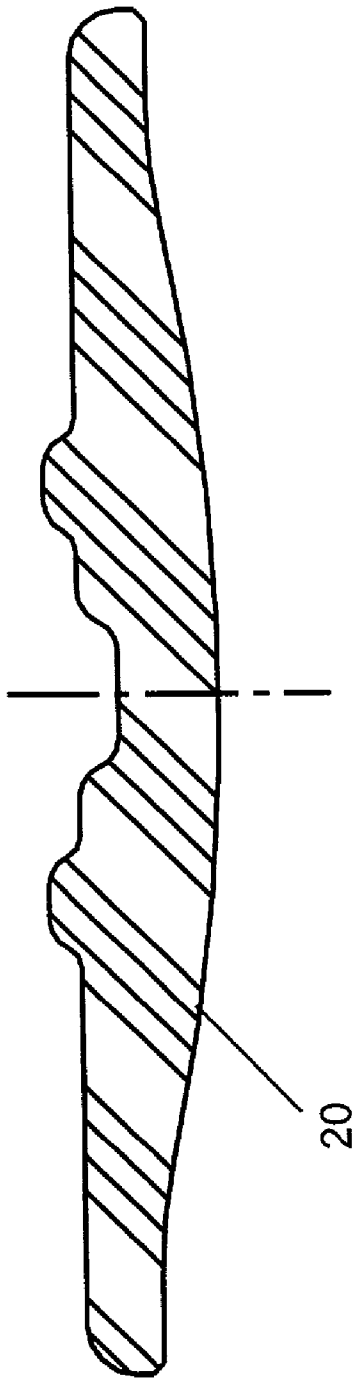


FIG. 2(C)

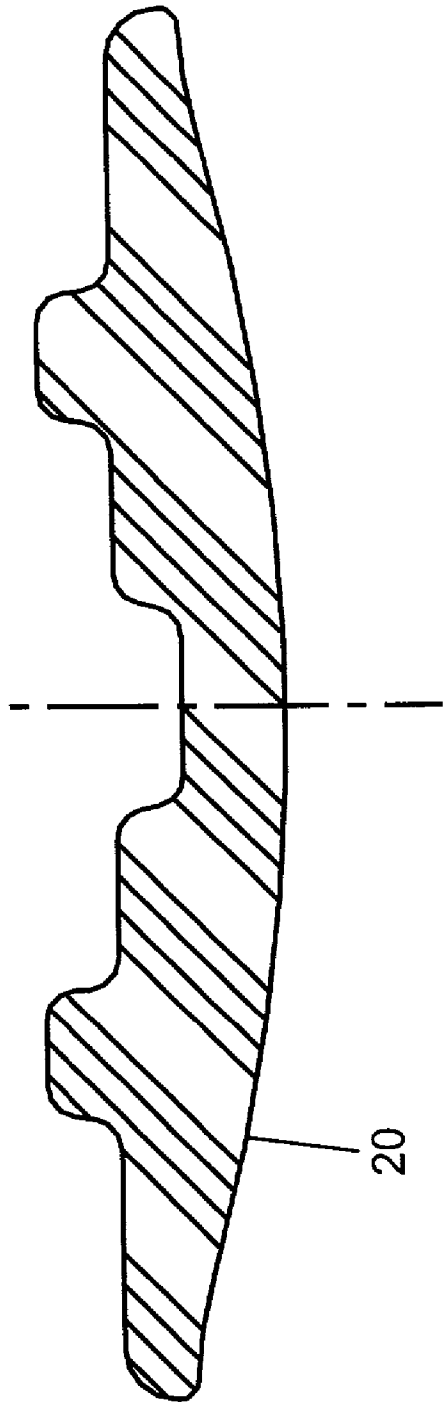


FIG. 2(D)

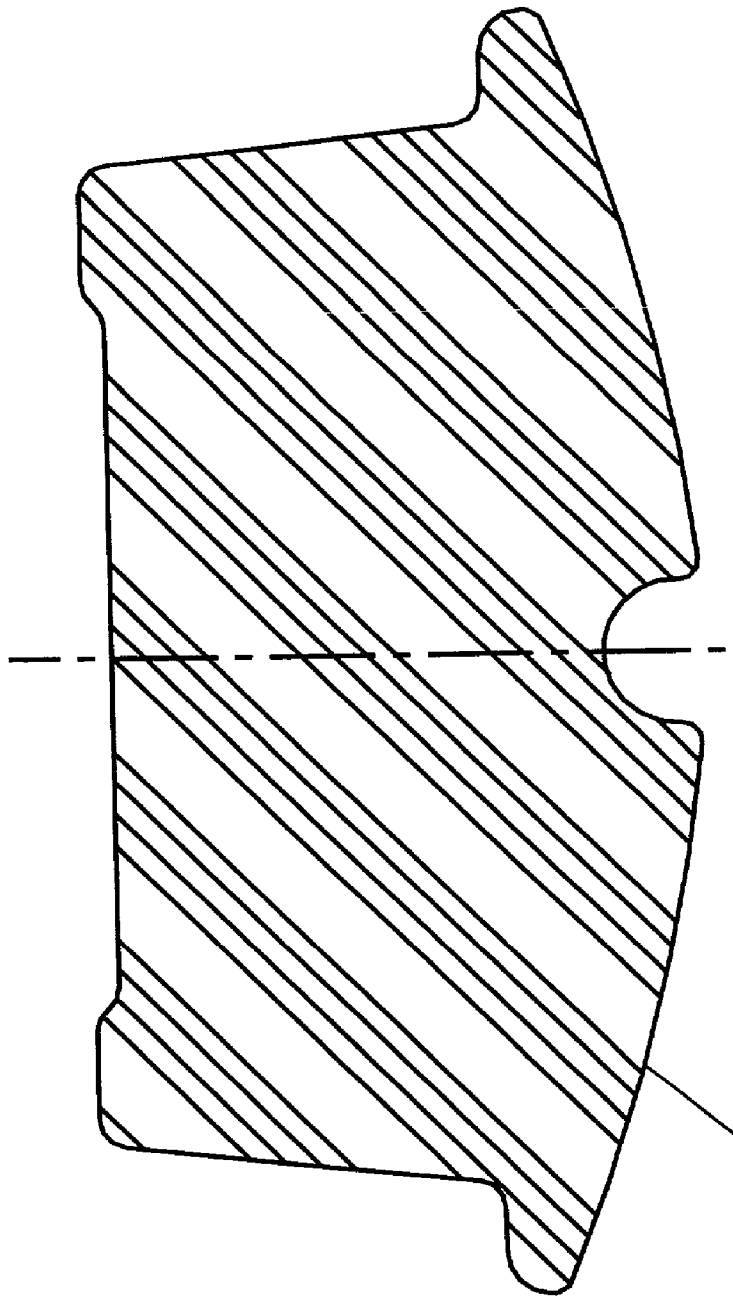


FIG. 2(E)

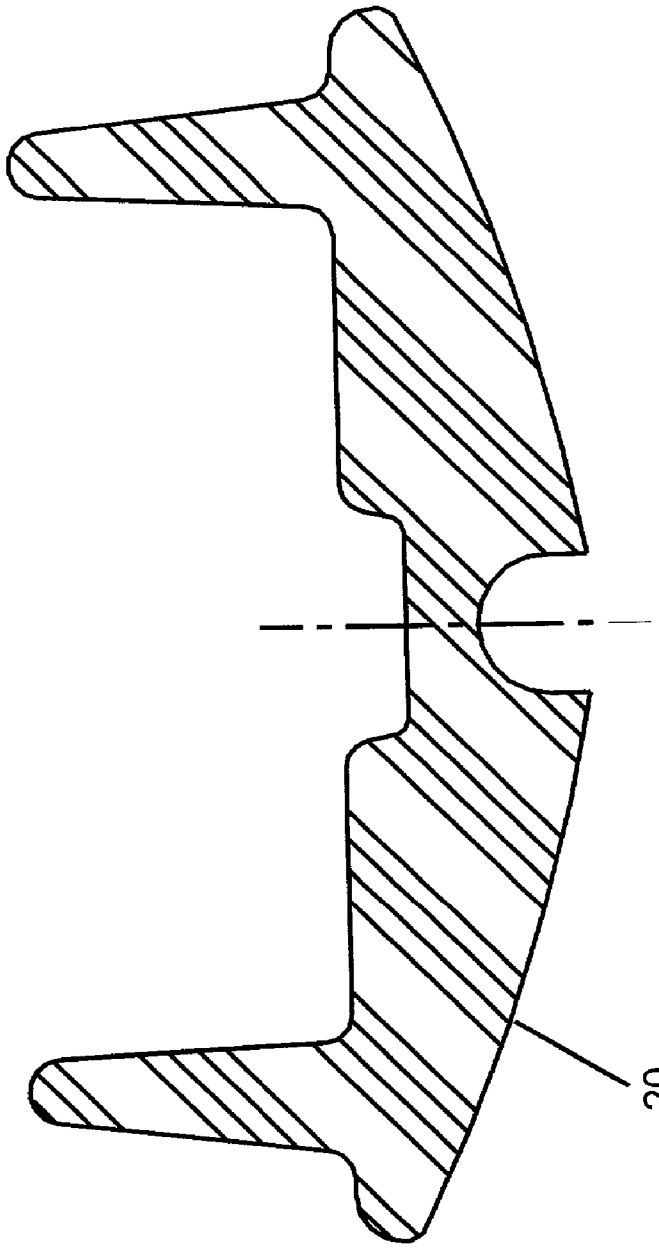


FIG. 2(F)

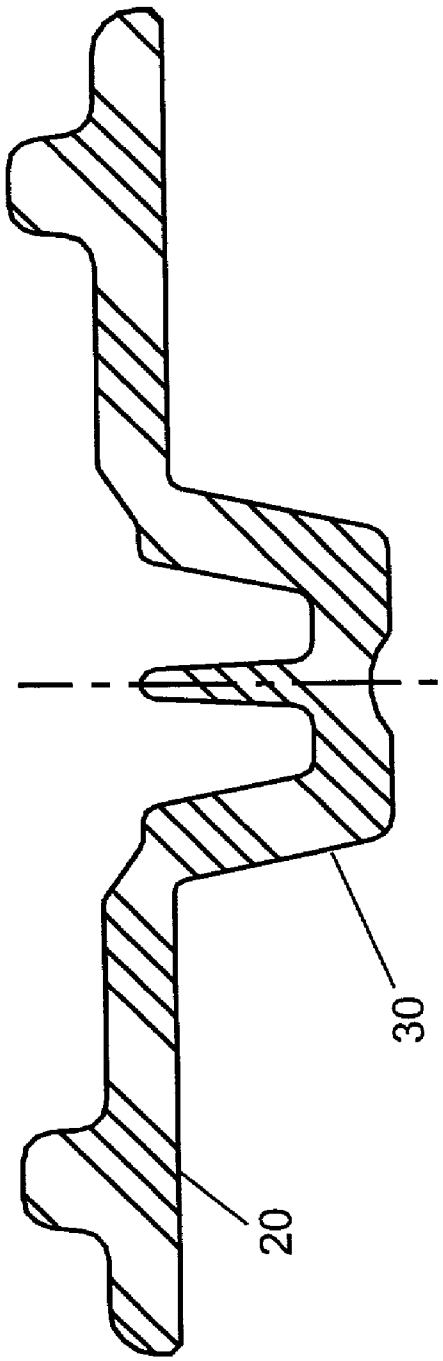


FIG. 2(G)

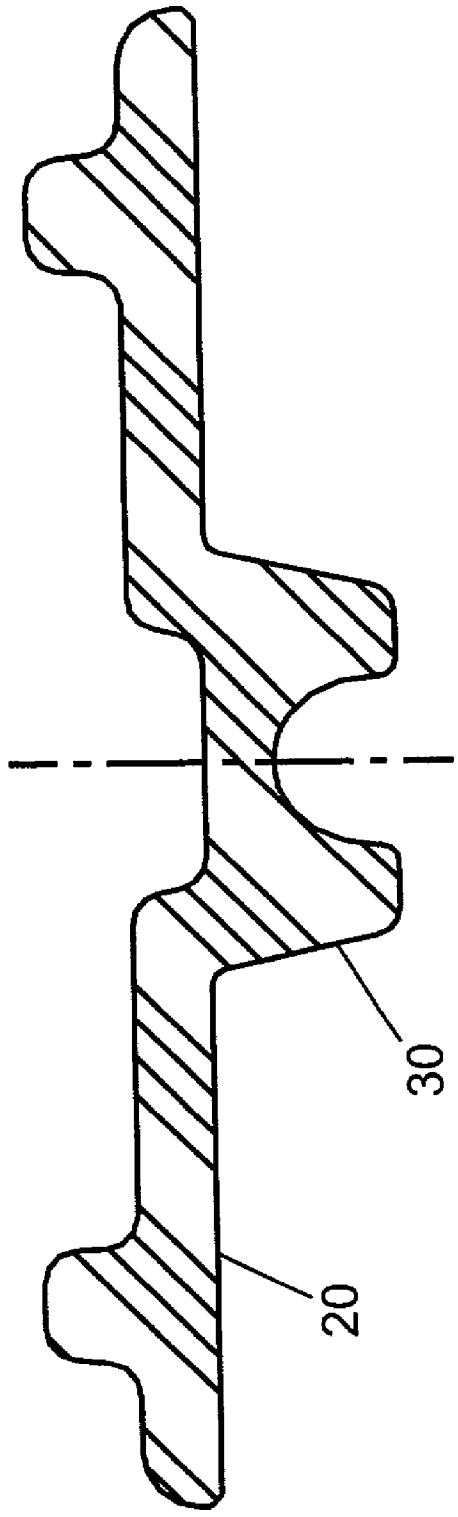


FIG. 2(H)

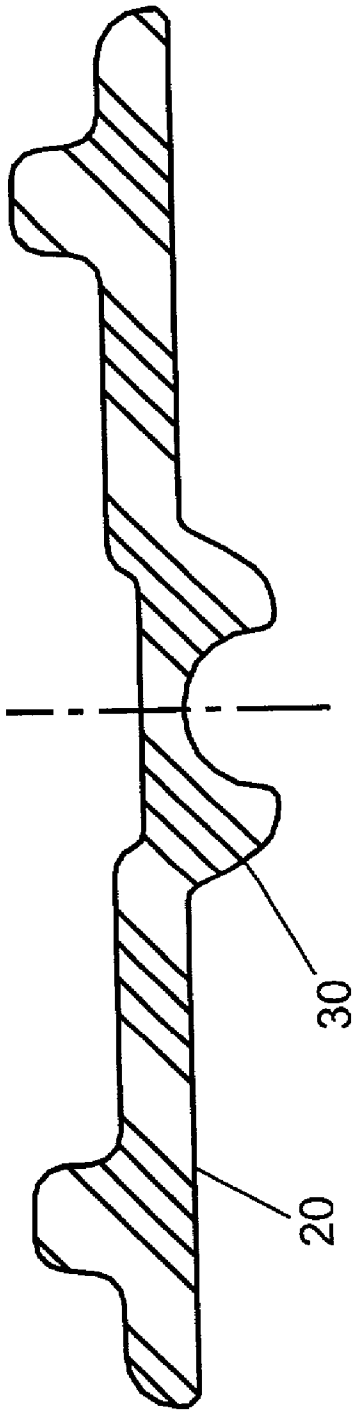


FIG. 2(l)

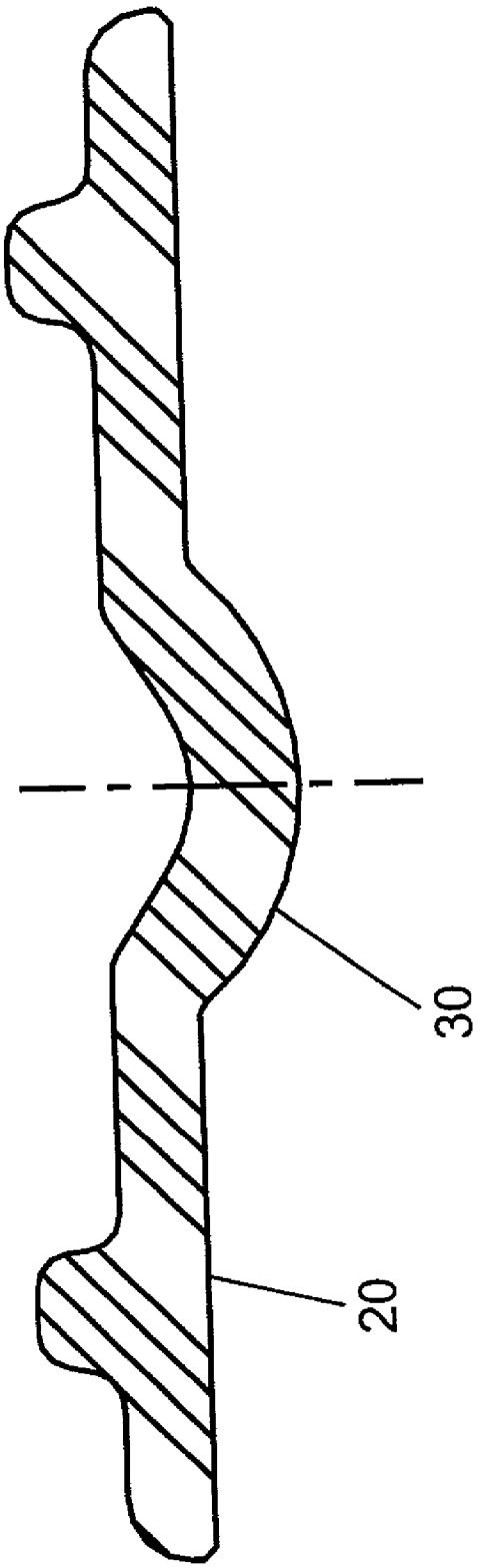


FIG. 2(J)

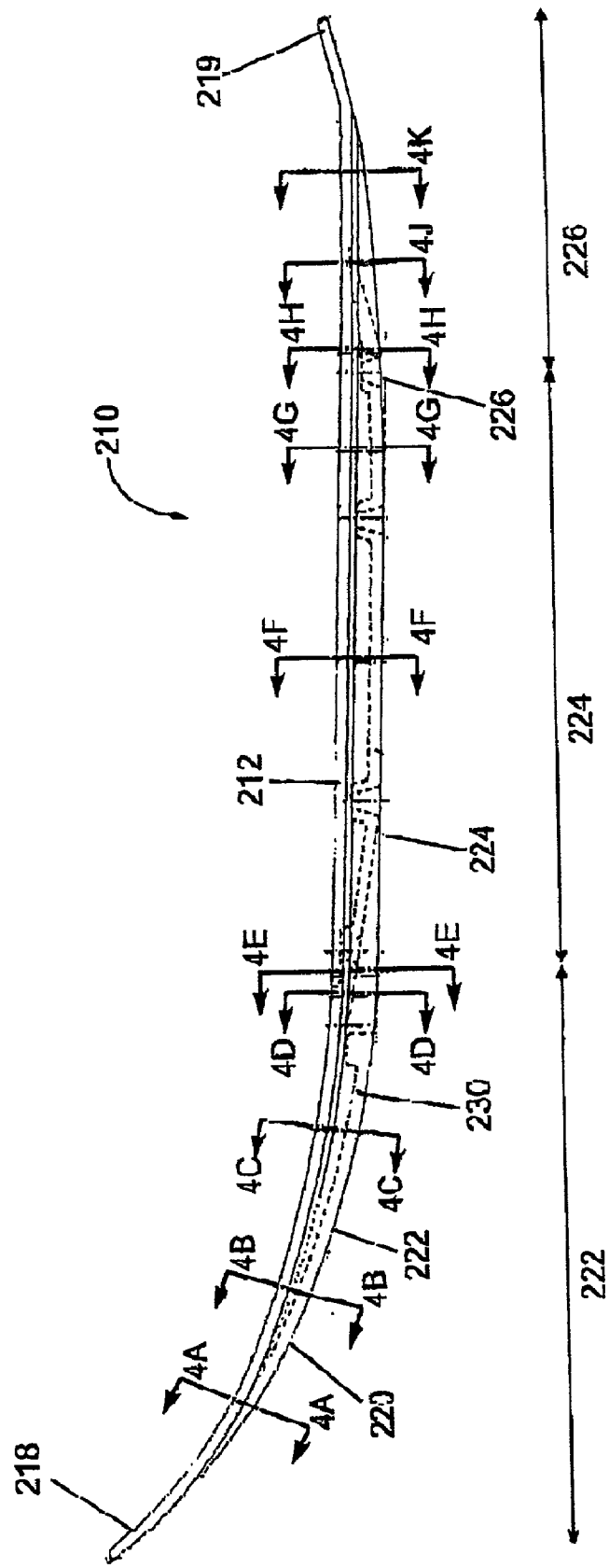

219
4K
4J
4H
4H
4G
4G
226
210
4F
4F
212
224
4E
4E
4D
4D
230
4C
4C
4B
4B
222
4A
4A
223
218
226
224
222

FIG. 3

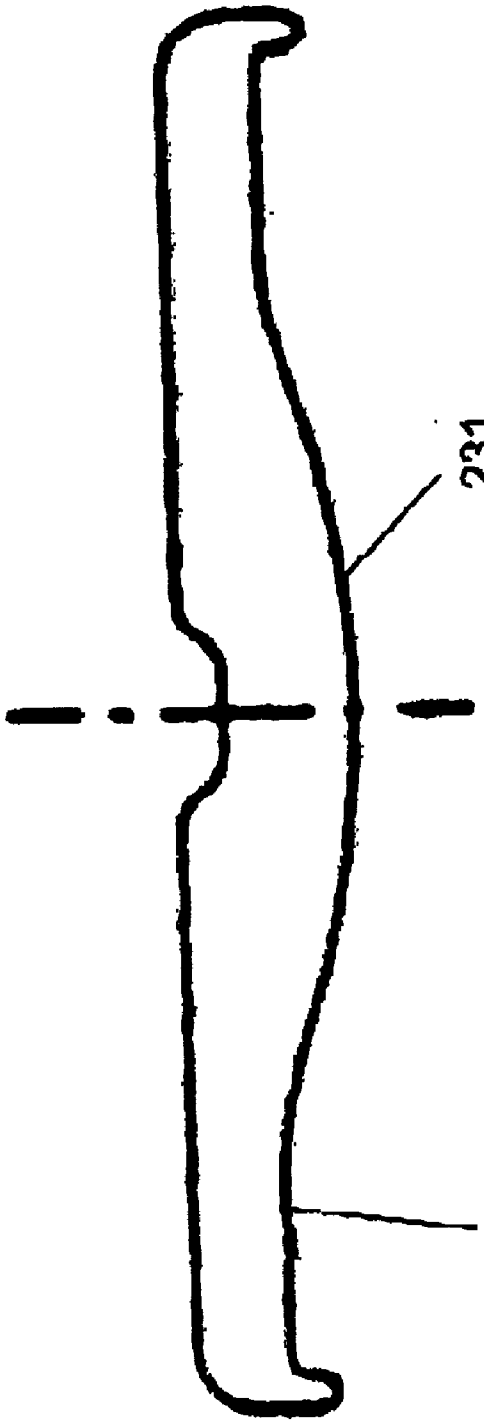


FIG. 4(A)

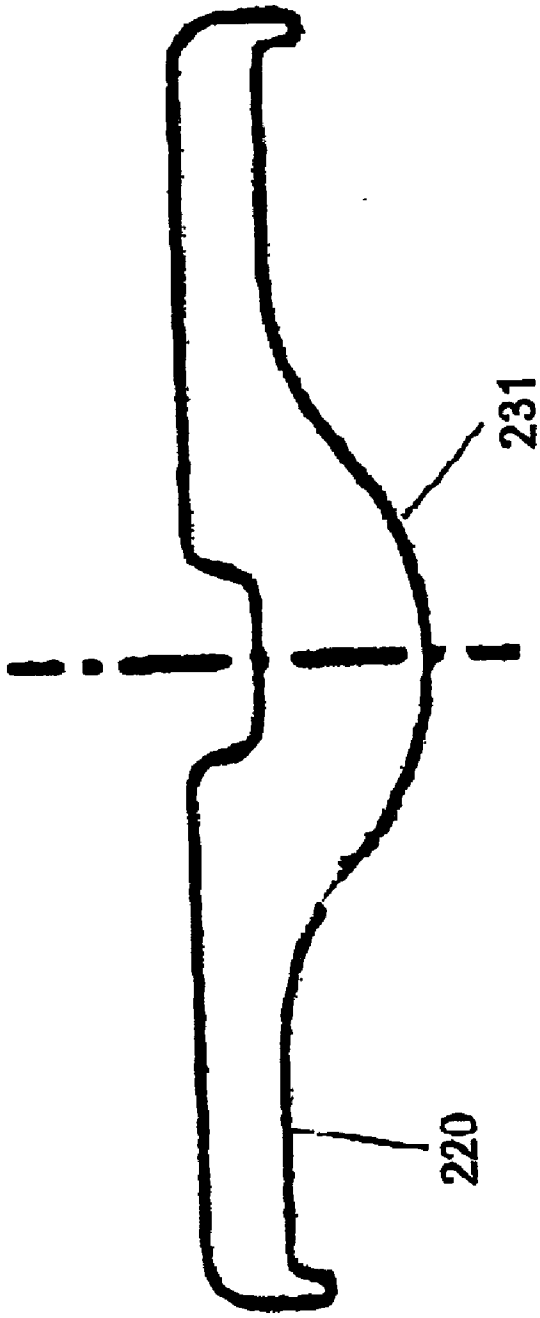


FIG. 4(B)

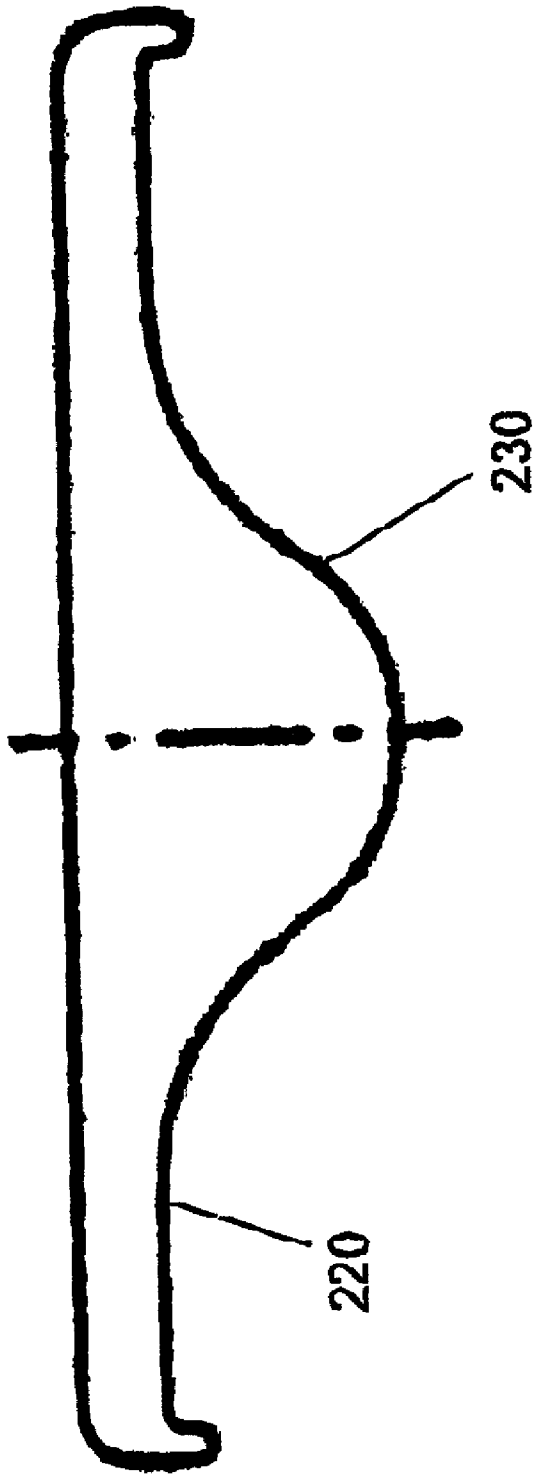


FIG. 4(C)

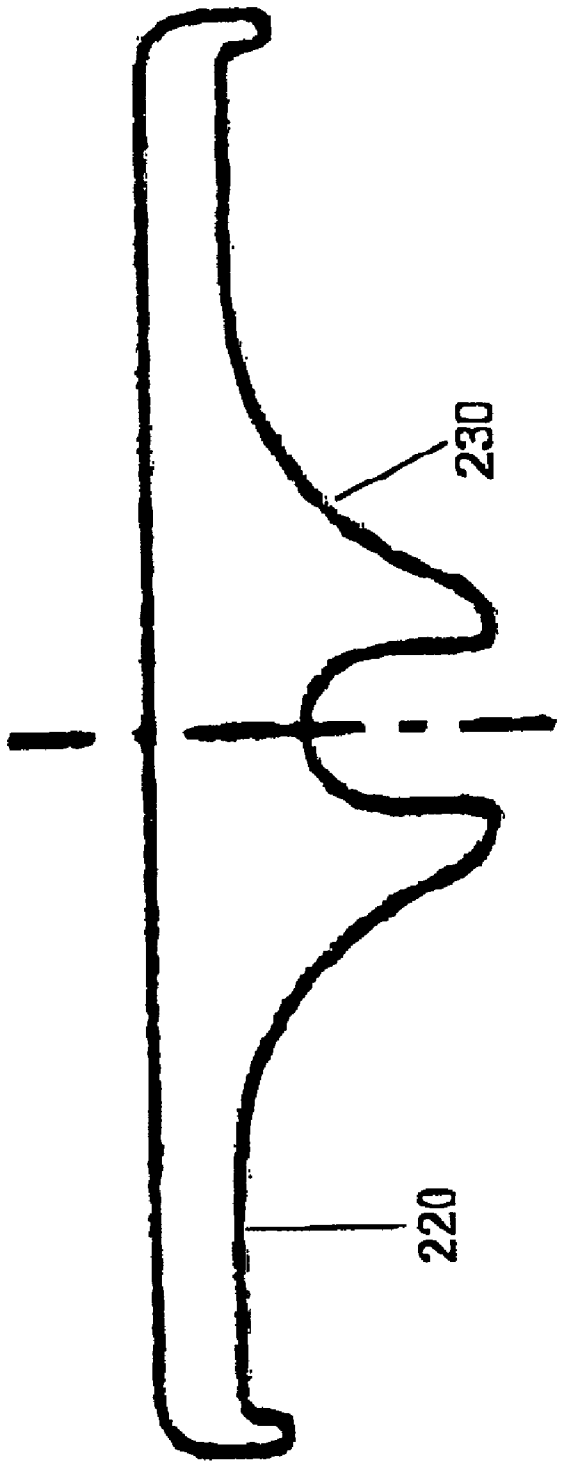


FIG. 4(D)

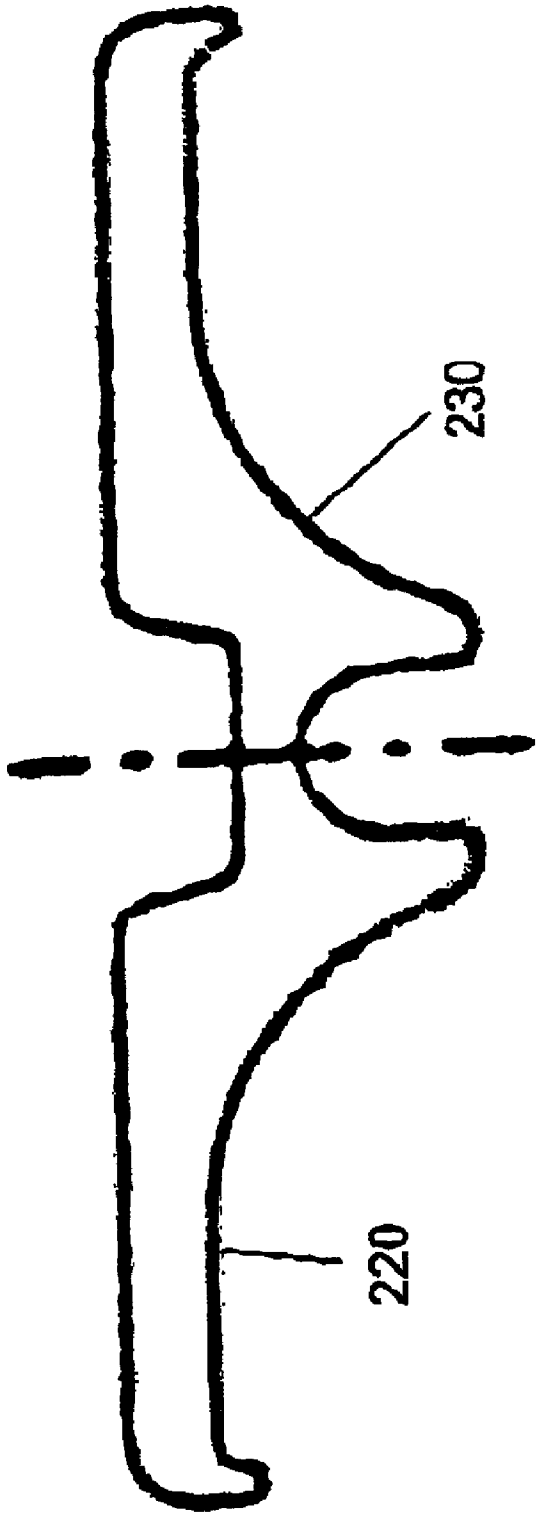


FIG. 4(E)

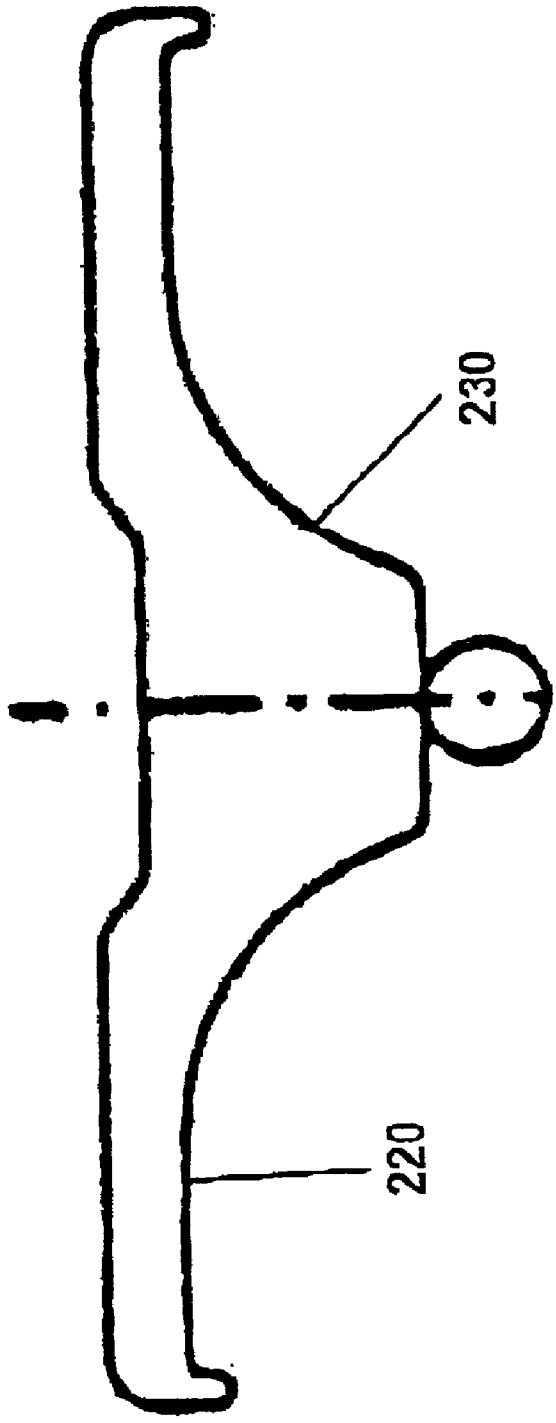


FIG. 4(F)

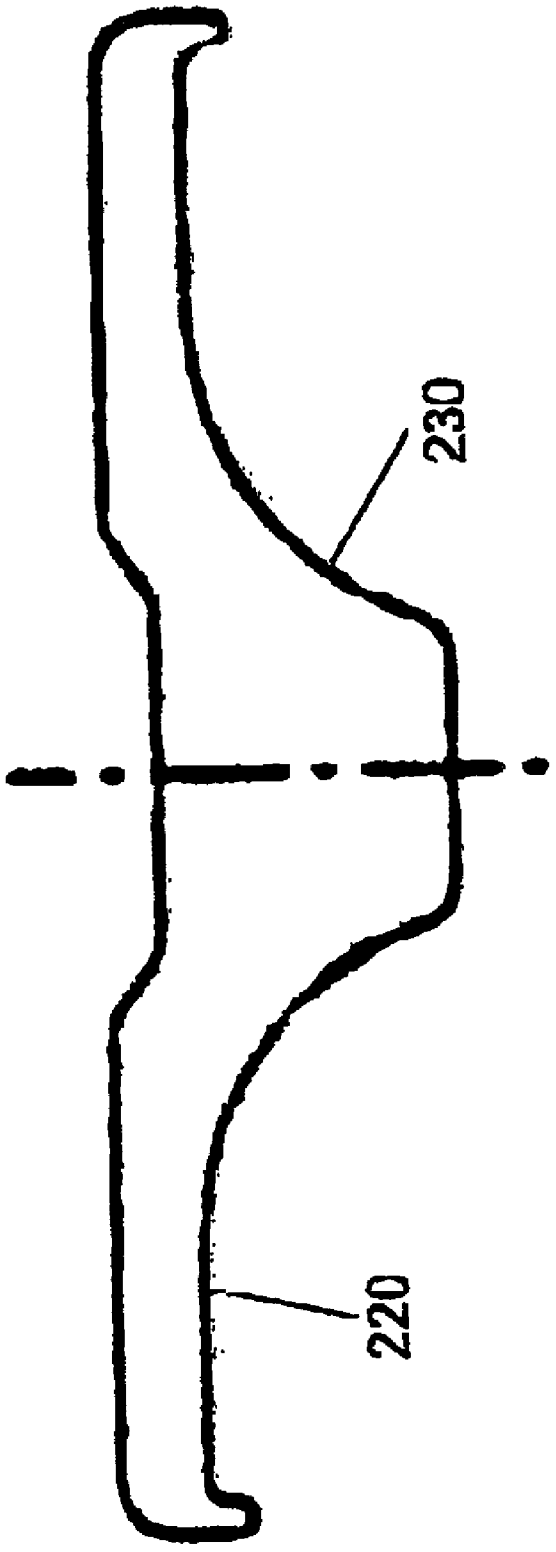


FIG. 4(G)

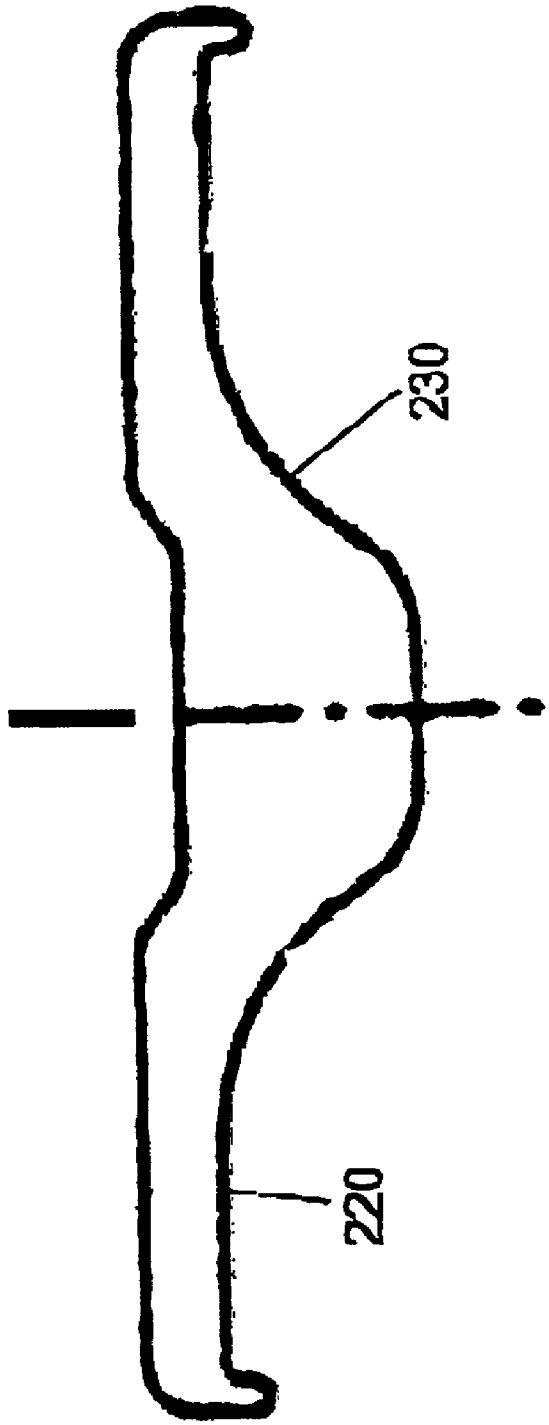


FIG.4(H)

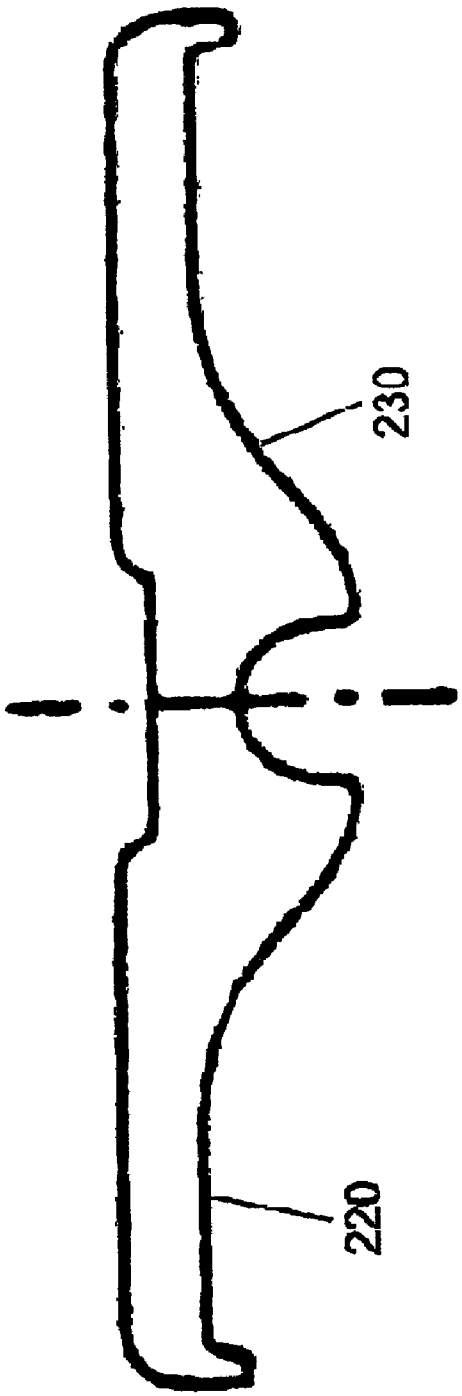


FIG. 4(l)

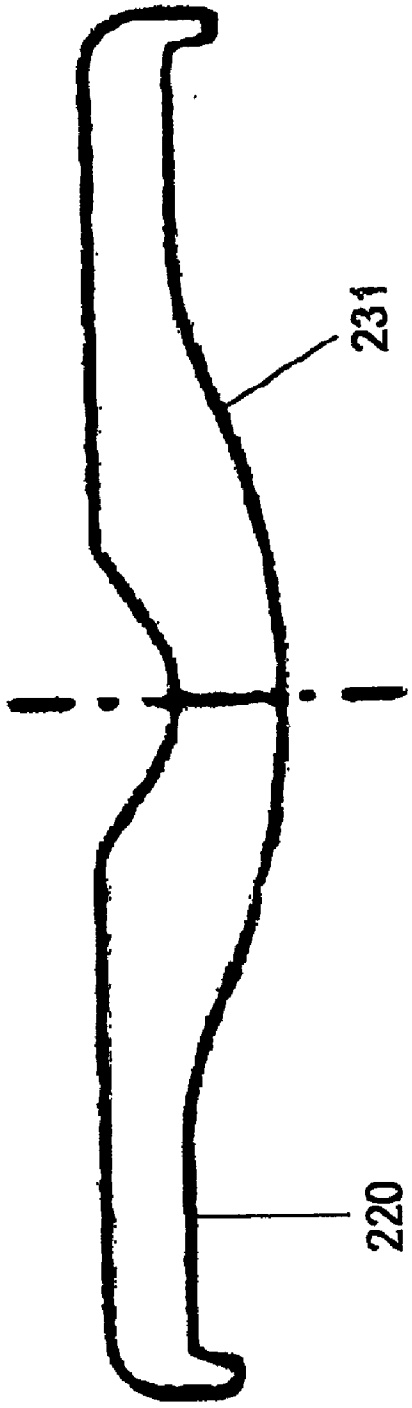


FIG. 4(J)

SNOWMOBILE SKI

[0001] This application claims the benefit of U.S. application Ser. No. 60/265,632, filed Feb. 2, 2001, which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a snowmobile ski, and particularly, a snowmobile ski having a substantially convex front portion.

[0004] 2. Description of Related Art

[0005] In designing snowmobile skis, there are several performance criteria that are deemed to be important. These include, inter alia, maneuverability, steerability, stability, flotation, and side-hilling capability. "Maneuverability" is also referred to as "aggressivity" in the industry and describes the ability of the skis to provide an effective and superior handling/steering of the snowmobile in response to the turning of the steering bar of the snowmobile. "Steerability" refers to the relative ease with which the snowmobile can be steered with the skis. By definition, a set of skis is easy to steer when the resistance to the steering is kept minimal. "Stability" addresses the pitching and darting tendency of the snowmobile skis during the ride. Rather than being aligned stably in the intended direction without much wavering, snowmobile skis may pitch and dart, thereby requiring frequent adjustments in steering to steer the skis and the snowmobile in the intended driving direction. "Floatation" refers to the performance of the skis on snow (as opposed to trails or ice) which allows the snowmobile to be propelled over snow. In such applications as mountain snowmobiles, a superior floatation characteristic is essential as the snowmobile will often be driven on deep fresh powder snow. Finally, "side-hilling capability" refers to the performance of the snowmobile skis, typically on mountain snowmobiles, when the snowmobile climbs a hill by traversing diagonally up the hill in a zig-zag fashion. In side-hilling, the snowmobile is tilted alternately in the direction of the turn, and as a result, the ski on the tilted side tends to be relied upon more heavily than the ski on the other side during each turn. In instances where the skis have poor side-hilling capabilities, the snowmobile may slip laterally because not enough snow is engaged by the skis when tilted on one side.

[0006] Depending on the intended application of the snowmobiles, the particularities of the designs of the snowmobile skis or the methods of attaching the skis to the snowmobile can be varied so as to optimize the desired performance characteristics of the skis. For example, the skis for snowmobiles designed for primarily trail applications, such as a touring type snowmobile, should have superior performance characteristics in stability, steering and aggressivity, whereas there is a high premium placed on floatation and side-hilling for skis designed for mountain snowmobiles. Indeed, prior patents illustrate numerous examples of attempts to improve the desired characteristics of the snowmobile skis.

[0007] For example, U.S. Pat. No. 5,038,882 shows a conventional snowmobile ski which comprises a ski liner adapted to be connected to a bridge on its top surface, a keel disposed longitudinally along the bottom snow-contacting surface of the ski liner, and a runner (also referred to as a "wear rod") disposed on the keel. The bridge connected to the ski liner's top surface is adapted to connect to the ski leg of the snowmobile. The ski shown in the '882 patent is typical of conventional skis in that the keel extends longitudinally along the middle of the ski bottom surface. Notably, the keel extends from the very front of the ski bottom surface all the way to the rear end of the ski bottom surface. The '882 patent states that a more comfortable ride can be obtained by a spindle arrangement which offsets its longitudinal axis from the ball joints connected to each spindle. Such an offset spindle arrangement, according to the '822 patent, induces the ski to "toe-out" thereby providing improved stability, i.e., less pitching and darting.

[0008] In other examples, U.S. Pat. Nos. 5,040,818 and 5,145,201 disclose a snowmobile ski having a plurality of concave surfaces extending along the snow contacting bottom surface of the ski. The ski shown in these two patents has a center concave surface extending along the middle of the ski and two concave steering surfaces which are recessed from the center concave surface that is equivalent to the keel of the ski. The '818 and '201 patents state that the plurality of concave portions provides floatation by compacting snow and lifting the ski and that the lateral recessed steering portions provide better stability and control as the ski turns. Much like the ski shown in the '822 patent, however, the center concave surface, or the keel, of the ski shown in the '818 and '201 patents longitudinally extends along the middle of the ski from the front end to rear end of the bottom surface. Stated another way, the keel runs longitudinally about the entire length of the bottom surface.

[0009] While snowmobile skis disclosed in the aforementioned patents have keels and runners longitudinally extending along the middle of the skis, several other prior patents disclose snowmobile skis with the keels or runners at the lateral sides of the skis, thereby forming a tunnel or channel—offering a different kind of snowmobile ski with its own set of advantages and disadvantages. For example, U.S. Pat. Nos. 3,734,221 and 3,817,544 disclose a snowmobile ski having a longitudinally extending central groove that creates a concave shape. The runners are provided on both sides of the groove, and the central groove is said to provide improved steerability. Finally, U.S. Pat. No. 5,836,594 discloses a double-keel snowmobile ski having the keels extending down from the two lateral edges of a flat middle portion of the ski liner, wherein vertically and horizontally extending wedges are provided at the longitudinal ends of each of the keels and a concave front portion of the ski liner is provided to funnel the snow to the middle portion of the ski liner. In particular, the ski disclosed in the '594 patent has double lateral keels disposed in the middle portion of the ski only to reduce resistance to yawing, which is defined in the '594 patent as lateral turning of the ski. According to the '594 patent, a snowmobile ski with the double-keel arrangement disclosed therein enhances floatation, efficient turning, and smooth forward and reverse movement. While skis with tunnel shaped bottom surfaces tout the respective improvements in various performance criteria, these skis are structurally more complex than the conventional skis with a single keel extending longitudinally in the middle of the bottom surface of the ski.

[0010] These and other prior art snowmobile skis heretofore available, however, do not teach or suggest a snowmobile ski having a substantially smooth convex front bottom

surface and a keel that extends longitudinally and substantially along the middle of the ski. Snowmobiles skis having these features in accordance with the present invention provide improved stability and steerability characteristics without sacrificing aggressivity.

SUMMARY OF THE INVENTION

[0011] It is an object of the present invention to provide a snowmobile ski with improved performance characteristics. According to an aspect of the present invention, a snowmobile ski is provided with a bridge adapted to connect to a ski leg of a snowmobile; a ski body having a top surface adapted to be connected to the bridge and a bottom surface adapted for moving over snow, the bottom surface having a front portion, a middle portion and a rear portion; a single keel running lengthwise exclusively along the middle portion and the rear portion of bottom surface of the ski body; and a runner provided on the keel.

[0012] In accordance with another aspect of the present invention, a snowmobile ski is provided with a bridge adapted to connect to a ski leg of a snowmobile; a ski body having a top surface adapted to be connected to the bridge and a bottom surface adapted for moving over snow, the bottom surface having a front portion, a middle portion and a rear portion; a keel running lengthwise exclusively along the middle portion and the rear portion of bottom surface of the ski body and in such a manner that a longitudinally extending centerline of the keel is substantially aligned with a longitudinally extending centerline of the ski body; and a runner provided on the keel.

[0013] It is yet another aspect of the present invention to provide a snowmobile ski that comprises a bridge adapted to connect to a ski leg of a snowmobile; a ski body having a top surface adapted to be connected to the bridge and a bottom surface adapted for moving over snow, the bottom surface having a front portion, a middle portion and a rear portion; a keel running lengthwise exclusively along the middle portion and the rear portion of bottom surface of the ski body and in such a manner that a longitudinally extending centerline of the keel is substantially aligned with a longitudinally extending centerline of the ski body; and a runner provided on the keel, wherein the front portion of the bottom surface of the ski boy has a substantially convex shape.

[0014] Still it is yet another aspect of the present invention to provide a snowmobile ski comprising a bridge adapted to connect to a ski leg of a snowmobile; a ski body having a top surface adapted to be connected to the bridge and a bottom surface adapted for moving over snow, the bottom surface having a front portion, a middle portion and a rear portion; a single keel running lengthwise along the middle portion and the rear portion of bottom surface of the ski body; and a runner provided on the keel, wherein the front portion of the bottom surface has a smooth curve protrusion that blends into the keel.

[0015] Other objects and advantages of the present invention will be apparent from the appended claims and understood from the following detailed description of the present invention and the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Reference will be made hereinafter to the accompanying drawings which illustrate embodiments of the present invention discussed herein below, wherein:

[0017] **FIG. 1**(A) is a side view of a snowmobile ski in the prior art;

[0018] **FIG. 1**(B) is a sectional view of the snowmobile ski shown in **FIG. 1A** taken along line 1B-1B;

[0019] **FIG. 1**(C) is a sectional view of the snowmobile ski shown in **FIG. 1A** taken along line 1C-1C;

[0020] **FIG. 1**(D) is a sectional view of the snowmobile ski shown in **FIG. 1A** taken along line 1D-1D;

[0021] **FIG. 1**(E) is a sectional view of the snowmobile ski shown in **FIG. 1A** taken along line 1E-1E;

[0022] **FIG. 1**(F) is a sectional view of the snowmobile ski shown in **FIG. 1A** taken along line 1F-1F;

[0023] **FIG. 1**(G) is a sectional view of the snowmobile ski shown in **FIG. 1A** taken along line 1G-1G;

[0024] **FIG. 1**(H) is a sectional view of the snowmobile ski shown in **FIG. 1A** taken along line 1H-1H;

[0025] **FIG. 1**(I) is a sectional view of the snowmobile ski shown in **FIG. 1A** taken along line 1I-1I;

[0026] **FIG. 2**(A) is a side view of a snowmobile ski in accordance with the first embodiment of the present invention;

[0027] **FIG. 2**(B) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2B-2B;

[0028] **FIG. 2**(C) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2C-2C;

[0029] **FIG. 2**(D) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2D-2D;

[0030] **FIG. 2**(B) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2B-2E;

[0031] **FIG. 2**(F) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2F-2F;

[0032] **FIG. 2**(G) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2G-2G;

[0033] **FIG. 2**(H) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2H-2H;

[0034] **FIG. 2**(I) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2I-2I;

[0035] **FIG. 2**(J) is a sectional view of the snowmobile ski shown in **FIG. 2A** taken along line 2J-2J;

[0036] **FIG. 3** is a side view of a snowmobile ski in accordance with the second embodiment of the present invention;

[0037] **FIG. 4**(A) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line 4A-4A;

[0038] **FIG. 4**(B) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line 4B-4B;

[0039] **FIG. 4**(C) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line 4C-4C;

[0040] **FIG. 4**(D) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line 4D-4D;

[0041] **FIG. 4**(E) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line 4E-4E;

[0042] **FIG. 4**(F) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line **4**F-**4**F;

[0043] **FIG. 4**(G) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line **4**G-**4**G;

[0044] **FIG. 4**(H) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line **4**H-**4**H;

[0045] **FIG. 4**(I) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line **4**I-**4**I;

[0046] **FIG. 4**(J) is a sectional view of the snowmobile ski shown in **FIG. 3** taken along line **4**J-**4**J;

DETAILED DESCRIPTION OF THE PRESENT INVENTION

[0047] A conventional snowmobile ski is shown in FIGS. **1**(A)-**1**(I). As can be seen in FIGS. **1**(A)-**1**(I), the conventional snowmobile ski **110** comprises a ski body **112** (also referred to in the art as a ski liner) having a top surface **114** that has a bridge portion **116** that is adapted to be connected to a ski leg of a snowmobile. The bridge portion **116** on the top surface of **114** of the ski body **112** may be integrally formed with the ski body **112** or may have a discrete bridge assembly unit (typically metal or aluminum) and a corresponding bridge mating portion on the top surface **114** of the ski body **112** via nuts and bolts connection. The ski body has a front end **118** and a rear end **119**. The front end **118** of the ski body **112** may be adapted to connect to a plastic handle (not shown).

[0048] The ski body **110** further comprises a bottom surface **120** that is adapted for moving over snow or trail in response to the propulsion provided by ground engaging track (not shown). For ease of describing the present invention and conventional snowmobile skis related to the present invention the ski body will be described as having a front portion, a middle portion and a rear portion. In **FIG. 1**(A), the bottom surface **120** of the ski body **112** has a front portion **122** that is upturned so that the ski will move smoothly over the snow or trail; a middle portion **124** that is substantially a flat surface; and a rear portion **126** that is also upturned, much like the front portion **122** except to a lesser degree.

[0049] As can be seen in FIGS. **1**(C)-**1**(I), a keel **130** is provided on the bottom surface **120** of the ski body **112** and extends longitudinally along the middle of the bottom surface **120** of the ski body **112**. The keel **130** is a protrusion extending downwardly from the bottom surface **120** of the ski body **112** and typically has a trapezoidal cross-sectional shape. A wear rod, such as a metal guide rod or carbide runner, is placed on the bottom surface of the keel **130**. For example, FIGS. **1**(E) and **1**(H) show indentations **134** on the bottom surface **132** of the keel **130** that is adapted to receive a runner (not shown).

[0050] In conventional snowmobile skis, such as one shown in FIGS. **1**(A)-**1**(I), the ski body **112** typically has a flat horizontal cross section from one lateral end of the ski body **112** to the other later end except for the downwardly protruding keel **130**, as illustrated in FIGS. **1**(B)-**1**(I). While these prior art skis have an acceptable degree of stability (i.e., sufficiently less incidents of pitching and darting) and aggressivity in response to the steering, these skis can be difficult to steer. This problem is related to un-optimized weight distribution ratio of the skis and a "wall" effect of the keel. More specifically, during normal operation, the snowmobile frequently places more weight in the front portion of the skis than the rear portion of the ski. Further, the "wall" effect of the keel is created where the ski resists turning in response to the steering because the side wall **136** of the keel **130** runs into compacted snow when attempting to turn. Thus, conventional skis such as shown in FIGS. **1**(A)-**1**(I), which is the most common type of the snowmobile skis presently available on the market, are thought to have acceptable stability and aggressivity characteristics while having poor steering characteristics.

[0051] A first embodiment of the snowmobile ski **10** made in accordance with the principles of the present invention is shown in FIGS. **2**(A)-**2**(J). The components of the snowmobile ski **10** made according to an aspect of the present invention are numbered with the same reference numerals as the corresponding components of the prior art snowmobile ski **110** shown in FIGS. **1**(A)-**1**(I), except that the reference numerals for the components of the prior art snowmobile ski **110** start with **100**.

[0052] As can be observed from FIGS. **2**(A)-**2**(J), the front portion **22** of the bottom surface **20** of ski body **12** of the present invention has a convex, curved cross-sectional shape, in contrast to the flat side-to-side cross-sectional shape of the bottom surface of the prior art ski shown in FIGS. **1**(A)-**1**(I). The middle portion **24** and the rear portion **26** of the ski **10**, as shown in FIGS. **2**(H) and **2**(J), have a substantially flat bottom surface except for the keel **30** extending downwardly from the bottom surface **20**. The convex shape of the front portion **22** of the bottom surface **20** of the ski body **12** is formed by a smooth curve formed by the front portion **22**.

[0053] Furthermore, as shown in FIGS. **2**(C)-**2**(F), the front portion **22** of the bottom surface **20** does not have a keel **30**. The keel **30** is provided only in the middle portion **24** and the rear portion **26**. The keel **30** extends lengthwise along the middle of the ski **10**. That is, the centerline of the keel **30** extending longitudinally is substantially aligned with the centerline of the ski body **12** along the longitudinal direction. As shown in FIGS. **2**(G)-**2**(I), the keel **30** has a substantially trapezoidal cross section in the middle portion **24** of the bottom surface **20** of the ski body **12**. However, the cross section of the keel **30** can be more curved than trapezoidal, similar to the keels shown in FIGS. **4**(D)-**4**(H) and towards the rear end **19** of the ski body **12** as shown in **FIG. 2**(J).

[0054] In the embodiment shown in FIGS. **2**(A)-**2**(J), the convex curved bottom surface **20** of the ski body **12** meshes into the keel **30** where the keel **30** begins to extend downwardly from the bottom surface **20** and to extend longitudinally rearward starting from the middle portion **24** of the bottom surface **20**.

[0055] Another embodiment of the present invention is shown in **FIG. 3** and FIGS. **4**(A)-**4**(J), with components having reference numerals beginning with **200** corresponding to the components of skis illustrated in FIGS. **1**(A)-**1**(I) and FIGS. **2**(A)-**2**(J). The second embodiment of the present invention includes a smooth convex curved protrusion **231** provided in the front portion **222** of the bottom surface **220** of the ski body **212**. The smooth curved protrusion **231** meshes or blends into the keel **230**, which starts about in the

middle portion **224** of the bottom surface **220** of the ski body **212**. Thus, rather than the front portion **222** of the bottom surface **220** itself having a convex curved shape, the front portion **222** of the bottom surface **220** has an additional smooth curve protrusion **231** that is connected to the keel **230**. While a curved protrusion **231** is preferred in the front portion **222** of the bottom surface **220**, the protrusion may have a substantially smooth trapezoidal cross-sectional shape.

[**0056**] The keel **230** starts in a shape of a smooth convex curve near the front portion **222** but gradually assumes more of a trapezoidal shape. Like the first embodiment and the prior art ski shown in FIGS. **1**(A)-**1**(I), the keel **230** protrudes downwardly from the bottom surface **220** in the middle portion **224** and extends longitudinally along the middle of the ski body **212**. In the second embodiment shown in FIGS. **3** and FIGS. **4**(A)-**4**(J), the lateral ends of the keel **230** blend with bottom surface **220**.

[**0057**] In both the first and the second embodiments, the "wall" effect which results in poor steerability characteristics is reduced. In the first embodiment, since there is no keel **30** in the front portion **22** of the ski **10**, there is no side wall of the keel **30** to resist the steering of the ski at the front portion of the bottom surface. In the second embodiment, the smooth curve protrusions that blend into the keel offer less resistance to the snow in comparison with the side walls of the keel of the prior art.

[**0058**] Furthermore, the skis having no keels in the front portion in accordance with the present invention provide an improved weight ratio of the skis. Specifically, by eliminating the keel in the front portion there is more surface area and less weight towards the front of the ski and less surface area and more weight in the middle and rearward portions of the ski when the ski sits in powdery snow. In the prior art, there is more weight distributed toward the front of the ski and therefore there is a more even surface area and weight distribution towards the front of the ski. Additionally, having no keel in the front improves the stability provided by the skis by reducing incidents of pitching and darting.

[**0059**] The foregoing detailed description of this invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise embodiments disclosed. Other modifications and variations may be evident to practitioners in the art when considered in reference to this disclosure.

I claim:

1. A snowmobile ski, comprising:

a bridge adapted to connect to a ski leg of a snowmobile;

a ski body having a top surface adapted to be connected to the bridge and a bottom surface adapted for moving over snow, the bottom surface having a front portion, a middle portion and a rear portion; and

a single keel running lengthwise exclusively along the middle portion and the rear portion of the bottom surface of the ski body.

2. The snowmobile ski of claim 1, further comprising a runner provided on the keel.

3. The snowmobile ski of claim 1, wherein at least a portion of the bottom surface of the front portion has a convex cross-section.

4. The snowmobile ski of claim 2, wherein the runner runs lengthwise exclusively along the middle portion and the rear portion of the bottom surface of the ski body.

5. A snowmobile ski, comprising:

a ski body having a top surface for connecting to a snowmobile and a bottom surface adapted for moving over snow, the bottom surface extending longitudinally along a front portion, a middle portion and a rear portion,

wherein the bottom surface of the front portion includes a convex protrusion extending longitudinally along the bottom surface from the front portion toward the rear portion of the ski.

6. The snowmobile ski of claim 5, further comprising:

a single keel running lengthwise exclusively along the middle portion and the rear portion of bottom surface of the ski body; and

a runner provided on the keel running lengthwise exclusively along the middle portion and the rear portion of the bottom surface of the ski body,

wherein the convex protrusion meshes with the single keel along the middle portion of the ski body.

7. A snowmobile ski, comprising:

a bridge adapted to connect to a ski leg of a snowmobile;

a ski body having a top surface adapted to be connected to the bridge and a bottom surface adapted for moving over snow, the bottom surface having a front portion, a middle portion and a rear portion; and

a single keel running lengthwise along the middle portion and the rear portion of bottom surface of the ski body,

wherein the front portion of the bottom surface has a smooth curve protrusion that blends into the keel.

8. The snowmobile ski of claim 7, further comprising a runner provided on the keel running lengthwise exclusively along the middle portion and the rear portion of the bottom surface of the ski body.

9. A snowmobile ski, comprising:

a bridge adapted to connect to a ski leg of a snowmobile;

a ski body having a top surface adapted to be connected to the bridge and a bottom surface adapted for moving over snow, the bottom surface having a front portion, a middle portion and a rear portion; and

a keel running lengthwise exclusively along the middle portion and the rear portion of the bottom surface of the ski body, wherein a longitudinally extending centerline of the keel is substantially aligned with a longitudinally extending centerline of the ski body.

10. The snowmobile ski of claim 8, further comprising a runner provided on the keel.

* * * * *