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(54) **Three-in-one alpine ski**

(57) An alpine ski (111) that facilitates carving for beginner and intermediate skiers by having at its bottom surface two shallow wedge-shaped indentations (33,35), one at each edge, so that it is functionally equivalent to three narrow skis fused into one, the left-hand one of them being used on left turns, the right-hand one of them being used on right turns, all three of them being used when the ski (111) is flat on the snow. Also, a pair of alpine skis that facilitate carving for advanced skiers, the two skis being mirror images of each other, each ski having on its bottom surface one such indentation (33,35).

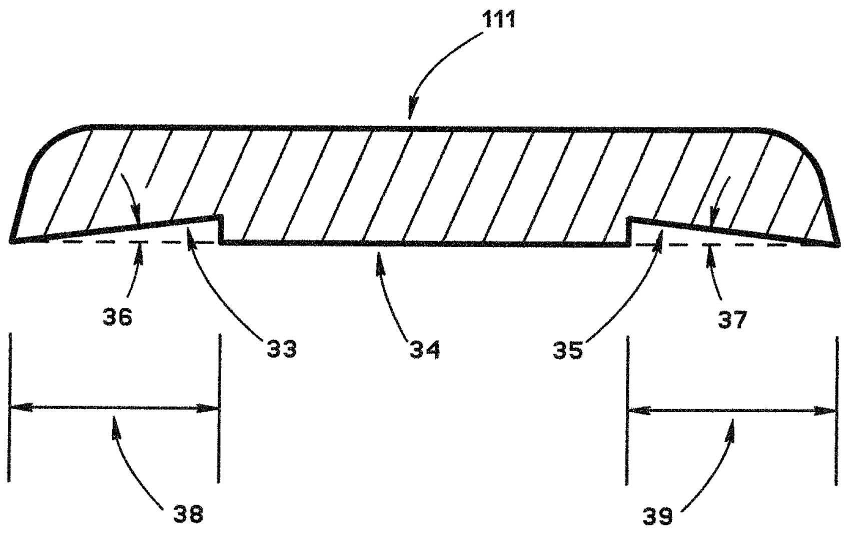

FIG. 8

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Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to the field of alpine skiing, and, in particular, to skis that reduce the amount of angulation required for carving.

BACKGROUND OF THE INVENTION

[0002] Conventional alpine skis have a flat bottom surface which enables them to easily move either forward, or sideways, or simultaneously forward and sideways. Pure forward motion is called tracking, on turns, carving, while sideways motion is called sideslipping, on turns, combined with forward motion, skidding. Carving is important, because it is very comfortable, enables fast skiing, and prevents loss of control at steep slopes, but sideslipping is equally, if not more, important, because it enables braking and making sharp turns. A ski that cannot carve is still a skiable ski, but a ski that cannot sideslip is not. Attempts to facilitate carving for non-expert skiers by adding sharp protrusions at the bottom surface of the ski, as, for example, in U.S. Patent 7,073,810 to A. F. Wilson, issued on July 11, 2006, do make the skis track easily, but also make sideslipping difficult, or even impossible, and therefore result in skis that are unusable: if carving is to be successfully made easier by using some deviation of the bottom ski surface from being flat, that deviation must necessarily be small, a fact that strongly suggests that any modify-the-bottom-surface attempt to facilitate carving is doomed to failure, because it stands to reason that small deviations can have only small effects.

[0003] This invention addresses the problem of making the skis carve easier; in order to make its description clearer, we briefly present below some well-known facts about alpine skiing.

[0004] Referring to Fig. 1, there is shown a schematic diagram that is useful in analyzing the main forces, gravitational and centrifugal, that act on the body a skier (not shown). The gravitational forces that act on the skiers body can be combined into an equivalent vertical force 20, applied at his center of mass 21. During a turn, centrifugal forces also act on his body, forces that can be combined into an equivalent force 22, perpendicular to the axis of the turn (i.e., parallel to the snow surface 23), also applied at his center of mass 21; further, forces 20 and 22 can be combined into one total force 24, also applied at his center of mass 21. For balance, if the skier has weight on both skis, the direction of total force 24 must hit the snow surface 23 between the two skis, ski 25 and ski 26, as shown schematically in rear view in Fig. 2; on the other hand, if, as often is the case, the skier has his entire weight on only one ski, the direction of total force 24 must hit that ski at the ski edge that is in contact with the snow surface 23, as shown in Fig. 3.

SUMMARY OF THE INVENTION

[0005] To simplify the discussion, we will only examine the case where the skier has his entire weight on one ski (analogous considerations hold for the case where both skis are weighted). Also, referring to Fig. 3, we will ignore the small forward component that total force 24 has (which serves to overcome ski friction), considering total force 24 as lying on a plane normal to the skis axis. Further, we will assume that the snow surface is packed powder, because the present invention primarily addresses skiing on such surfaces. The ski edge that is in contact with the snow surface 23 normally generates a narrow groove 27, typically about an inch wide, shown in Fig. 4, which supports the ski. On turns, it is usually desired that the ski move only forward on that groove, so that the turn be carved; any sideways motion would result in a normally undesirable skidded turn: it is therefore important to carefully examine the factors that influence such sideways motions, and to do this we need some less than well known facts about skiing, described below. Drawing, at the middle of groove 27, line 28 normal to the bottom surface 29 of the ski, as shown in Fig. 5, we can replace total force 24 by its components along line 28 and bottom surface 29; we will call the first of these components normal force 30, the second, tangential force 31. If the ski is to carve, tangential force 31 must be, as is in Fig. 5, directed into the snow surface 23, and, further, must be sufficiently strong so that, as the ski is moving forward, the ski tip be able to continuously dig into the snow, extending the groove in which the ski is riding; on the other hand, if tangential force 31 is, as in Fig. 6, directed away from the snow, the ski will sideslip, the groove will widen, and the turn will become a skidded one; the turn will also become skidded if the tangential force 31 is directed into the snow but is not sufficiently strong.

[0006] We define as center-of-mass angle 32 of the skier the angle between line 28 (which is normal to bottom surface 29) and the direction of the total force 24, and specify that it is to be taken as positive if, as in Fig. 5, the center of mass 21 lies, with respect to line 28, to the outside of the turn, and as negative, if, as in Fig. 6, it lies to the inside.

[0007] Letting CMA represent the center of mass angle 32, F represent the total force 24, and Ft represent the tangential force 31, with Ft taken as positive if tangential force 31 is directed into the snow surface 23, we conclude from Figs. 5 and 6 that $Ft = F * \sin(CMA)$. We can therefore restate the conclusion arrived at earlier, that for carving it is necessary that the tangential force 31 be directed into the snow and also be sufficiently strong, into the fundamental result: for carving, it is necessary that the CMA be positive and sufficiently large.

[0008] Fig. 7 shows schematically, in rear view, a skier making a left turn with all his weight on his outside ski, and body laterally unbent. As is evident from Fig. 7, his center of mass 21 lies, with respect to line 28 (defined as in Fig. 5) to the inside of the turn, so that this skiers CMA is negative, hence, under these conditions, he could not possibly be carving, he is bound to be skidding; in order to carve, he must increase his CMA, thru zero, to a sufficiently large positive value, by bending his body laterally to the outside of the turn, a manoeuver known as angulation.

[0009] The primary angulation used by skiers is knee angulation, an angulation requiring that the knees be bent, and, if a large increase of the CMA is needed, bent heavily. Unfortunately, heavy knee bending not only is tiring, but also dangerous, because the knee ligaments, as the knee is bent more and more, become effectively weaker and weaker: the two outer ones get to be out of position, abandoning the knees fate to the much weaker center ones.

[0010] The main goal of the presnt invention is to reduce the amount of angulation required for obtaining a given positive CMA value, that is, to reduce the amount of angulation required for carving.

[0011] Fig. 8 shows a rear view cross section of a ski built according to this invention, a ski that differs from skis of conventional construction by the addition of two wedge-shaped indentations, designated as left indentation 33 and right indentation 35, that extend along the length of the ski, as indicated in Fig. 9. We designate the bottom surface of the ski that lies between indentations 33 and 35 as center surface 34, the ski itslf as ski 111.

[0012] Left indentation 33 lies, with respect to center surface 34, at an angle called left indentation angle 36; its width is designated as left indentation width 38. Similarly, right indentation 35 lies, with respect to center surface 34, at an angle called right indentation angle 37; its width is designated as right width 39. As an example, let us assume that indentation angles 36 and 37 are equal to 3 degrees, and that indentation widths 38 and 39 are equal to 3/4 in.

[0013] On a left turn (on packed powder), essentially only left indentation 33 will be in contact with the snow, which means that, since center surface 34 and right indentation 35 will be off the snow, ski 111 will behave as if it had a flat bottom surface that is the extension of left indentation 33 to the right, leading to te conclusion that, on left turns, the effect of left indentation 33 is to increase the CMA of the skier by 3 degrees. This CMA increase, if the skier exerts on the ski a total force F equal to 160 lb., will increase the tangential force Ft that pushes the ski into the snow by 160 * sin 3° = 8.4 lb, a very significant amount.

[0014] Similarly, on a right turn (on packed powder), essentially only right indentation 35 will be in contact with the snow, so that, again, the CMA will increase by 3 degrees, resulting in an increase, by the same amount, of tangential force 31.

[0015] Finally, if ski 111 is flat on the snow, all three surfaces (indentation 33, center surface 34 and indentation 35) will be in contact with the snow, so that, since indentations 33 and 35 are only slight, its behavior will be close to the behavior of a conventional ski.

[0016] It is clear, therefore, that using indentations such as 33 and 35 in a ski significantly improves its carving characteristics without impeding its sideslip ability, a feat that, as remarked in the Background Section, appears at first glance to be impossible.

[0017] To be noted here that the advantages of ski 111 fully hold only for skiing on packed powder. On ice, ski 111 has no advantage over conventional skis, and, on deeper and deeper snow, its advantage over conventional skis is smaller and smaller; however, in no case does ski 111 become worse than a conventional ski. Ski 111 can be considered as consisting of three, glued together, skis: a narrow one on the left, used on and optimized for left turns, a narrow one on the right, used on and optimized for right turns, and a somewhat wider center one, all three being active when the ski is flat on the snow (or, when skiing in deep powder): this justifies calling it a three-in-one ski.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is simplified schematic view of the main physical forces acting upon a skiers body, in relation to a snow surface;

Fig. 2 is a simplified schematic view of the resultant of the main physical forces acting skier, in relation to his skis and a snow surface, the view being useful in understanding the condition for balance for a skier with weight on both skis;

Fig. 3 is a simplified schematic view of the resultant of the main physical forces acting upon a skier, in relation to his skis and a snow surface, the view being useful in understanding the condition for balance for a skier with weight on only one ski;

Fig. 4 is a simplified schematic view of the resultant of the main physical forces acting upon a skier that has weight on only one ski, in relation to that ski, the view showing the groove typically generated by the ski on the snow surface;

Fig. 5 is an simplfied schematic view of the skiers center of mass and ski of Fig. 4, showing the normal and tangential forces acting on the ski, for a positive center of mass angle;

Fig. 6 is an simplfied schematic view of the skiers center of mass and ski of Fig. 4, showing the normal and tangential forces acting on the ski, for a negative center of mass angle;

Fig. 7 is a schematic view of the lower body of a skier that has full weight on the outside ski and body that is laterally unbent, showing that his center of mass angle is negative;

Fig. 8 is a transverse cross section of an alpine ski constructed according to the teachings of the present invention;

Fig. 9 is a fragmentary bottom perspective of an alpine ski constructed according to the teachings of the present invention;

Figs. 10A and 10B depict transverse cross sections of alpine skis constructed according to variations of the present invention;

Fig. 11 is a rear view, transverse cross section of another embodiment of an alpine ski constructed according to the teachings of the present invention, the alpine ski representing the right ski of a pair of mirror image skis.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] A first preferred embodiment of the invention is an alpine ski, shown in rear view transverse cross section in Fig. 8 and in fragmentary bottom perspective in Fig. 9, that differs from conventional alpine skis by the addition at its bottom surface of two shallow wedge-shaped indentations, 33 and 35, of indentation angles 36 and 37, and indentation widths 38 and 39, indentations that extend along the majority of the length of the ski, with indentation angles 36 and 37 being in the 3 to 5 degree range, indentation widths 38 and 39 in the 5/8 to 1 inch range. Optimum values for the parameters indentation angles 36 and 37 and widths 38 and 39 depend on the particular ski whose design is being modified, and should be determined by the ski manufacturer. Further, the indentation widths 38 and 39 could be constant or be varying along the length of the ski.

[0020] Although indentations 33 and 35 are depicted in Fig. 8 as starting exactly at the ski edges, they could also start somewhat inward, for example, as shown in Fig. 10A, after the hardened steel strip 40 that all skis have at each of their edges, and also that, instead of, as depicted in Fig. 8, ending sharply, they could end in less abrupt fashion, as shown in in Fig. 10B, with these variations not falling outside the scope of this invention.

[0021] This embodiment should serve beginner, intermediate, and some advanced skiers.

[0022] A second preferred embodiment of the invention is a pair of alpine skis, one for the left and one for the right leg of the skier, the two skis being mirror images of each other, the latter of these skis differing, as depicted in rear view cross section in Figure 11, from conventional alpine skis by the addition at its bottom surface of one shallow wedge-shaped indentation, called left indentation 33, of angle left indentation angle 36, and width left indentation width 38, that extends along the majority of the length of the ski, with left indentation angle 36 being in the 3 to 5 degree range, width 38, in the 5/8 to 1 inch range.

[0023] Optimum values for left indentation angle 36 and width 38 depend on the particular ski whose design is is being modified, and should be determined by the ski manufacturer.

[0024] Although indentation 33 is depicted in Fig. 11 as starting exactly at the ski edge, it could also start somewhat inward, for example, as shown in Fig. 10A, after the hardened steel strip 40 that all skis have at each of their edges, and also that, instead of, as depicted in Fig. 8, ending sharply, it could end in less abrupt fashion, as shown in Fig. 10B, with these variations not falling outside the scope of this invention.

[0025] This embodiment should serve advanced and expert skiers.

[0026] The invention claimed is:

Claims

1. An alpine ski constructed as conventional alpine skis are, with the difference that its bottom surface is shaped to define two shallow wedge-shaped indentations,
each indentation extending along at least the majority of the length of the ski,
each indentation being spaced apart from the corresponding ski edge by at most 0.25 inches,
each indentation extending in the transverse direction at an angle relative to the bottom surface that does not exceed 10 degrees,
each indentation having width that does not exceed 1.5 inches, a width that along the length of the ski can be constant or varying.

2. An alpine ski pair, constructed as conventional alpine skis are, with the difference that the bottom surface of each ski is shaped to define one shallow wedge-shaped indentation,so that the two skis are mirror images of each other, said indentation extending along at least the majority of the length of the ski,
said indentation being spaced apart from the corresponding ski edge by at most 0.25 inches,
said indentation extending in the transverse direction at an angle relative to the bottom surface that does not exceed 10 degrees,
said indentation having width that does not exceed 1.5 inches, a width that along the length of the ski can be constant or varying.

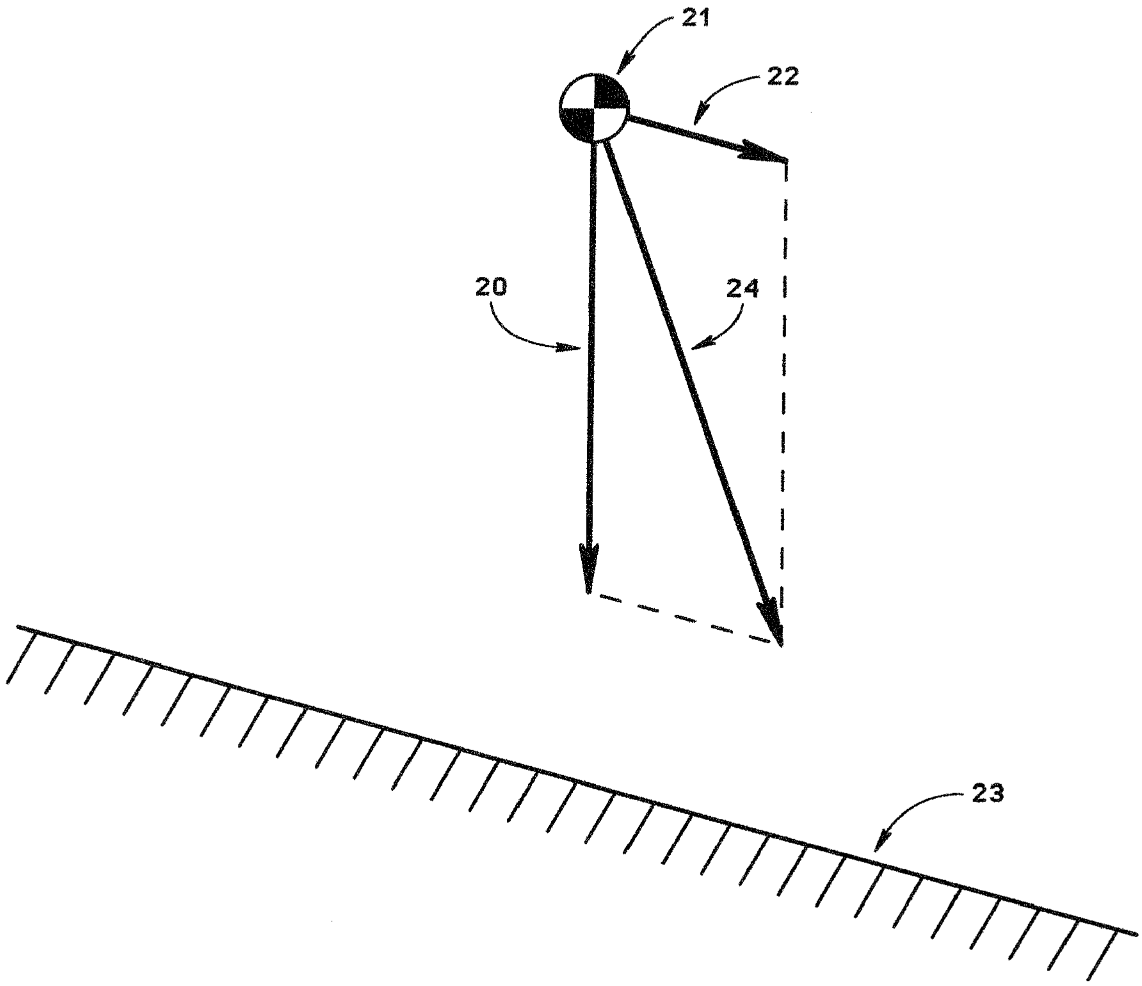

FIG. 1

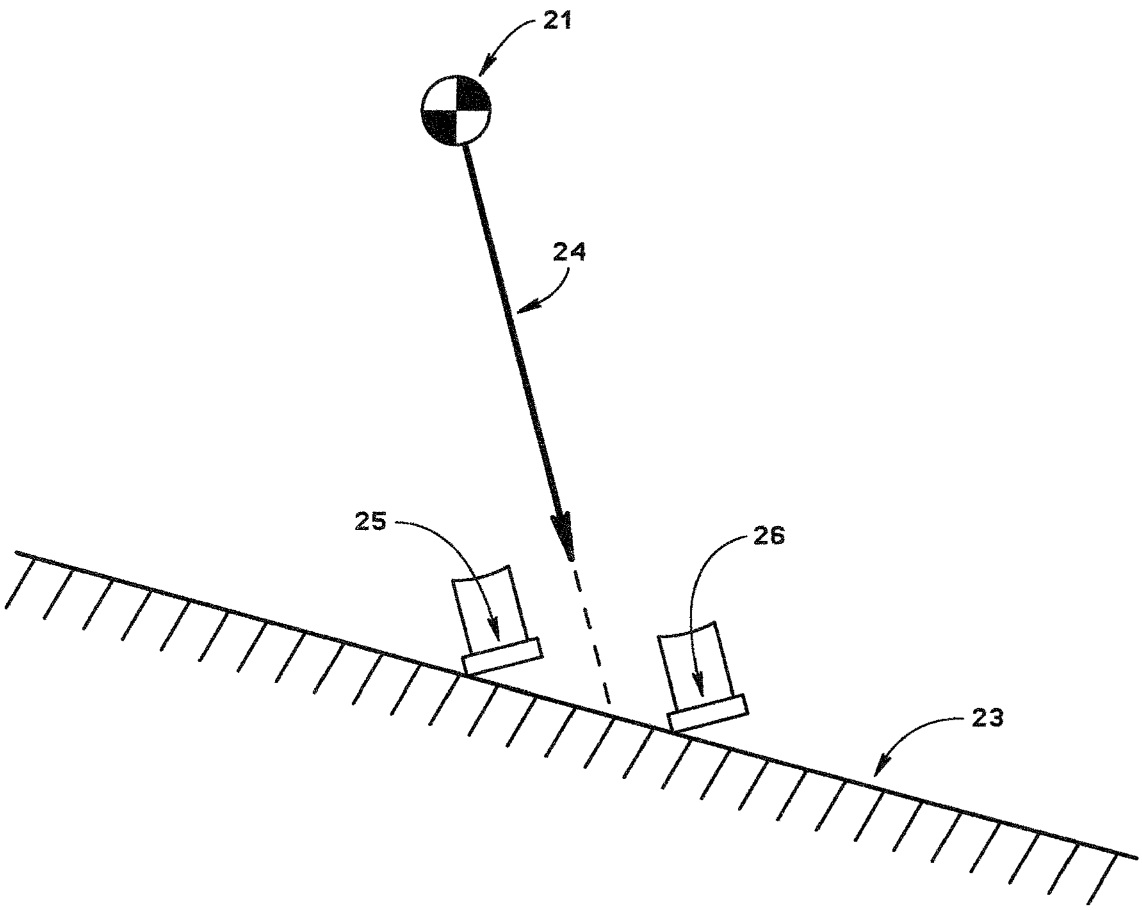

FIG. 2

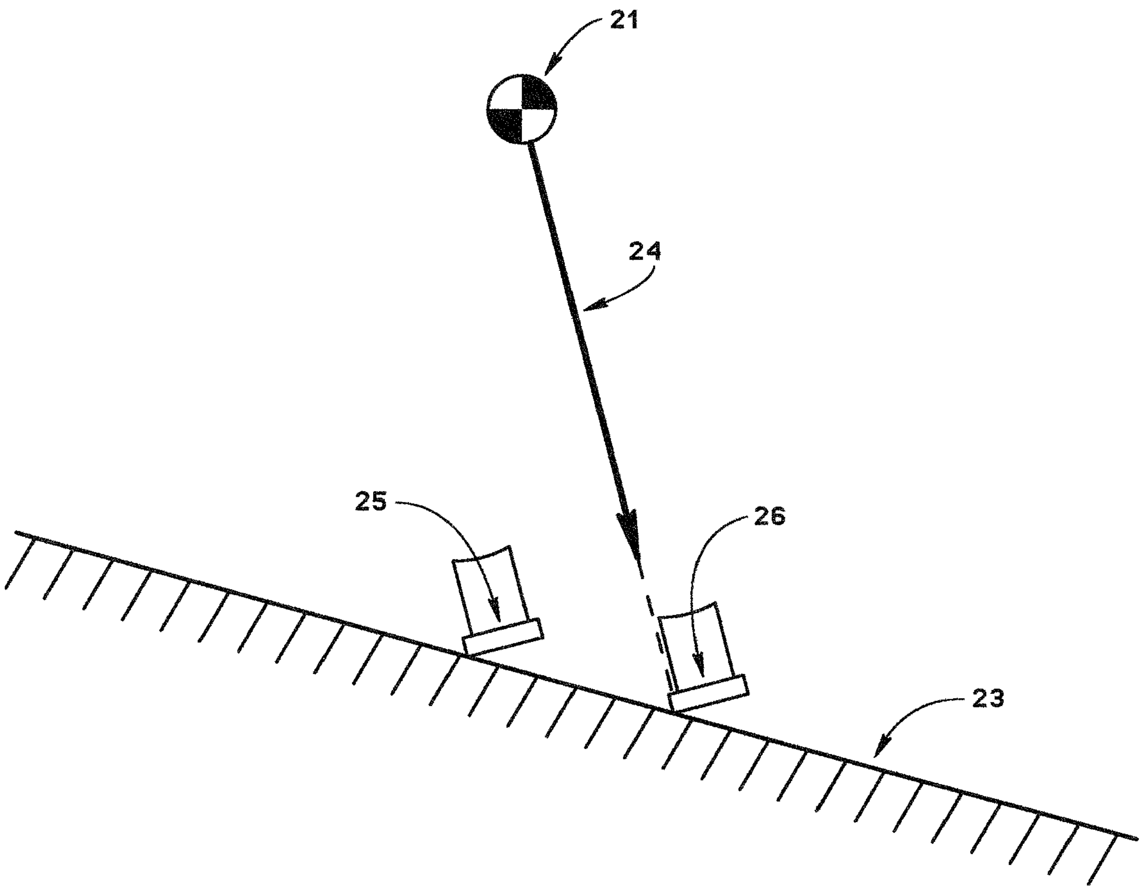

FIG. 3

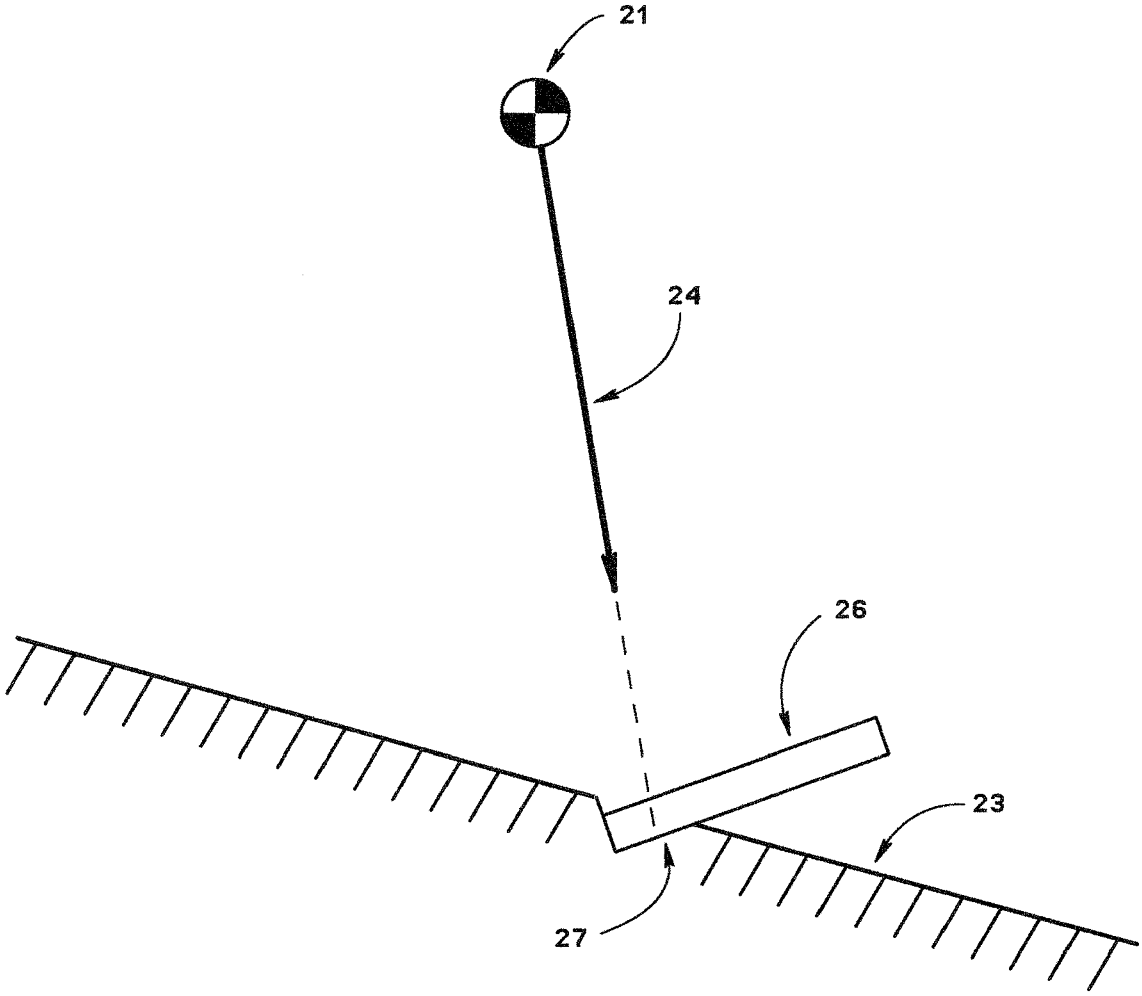

FIG. 4

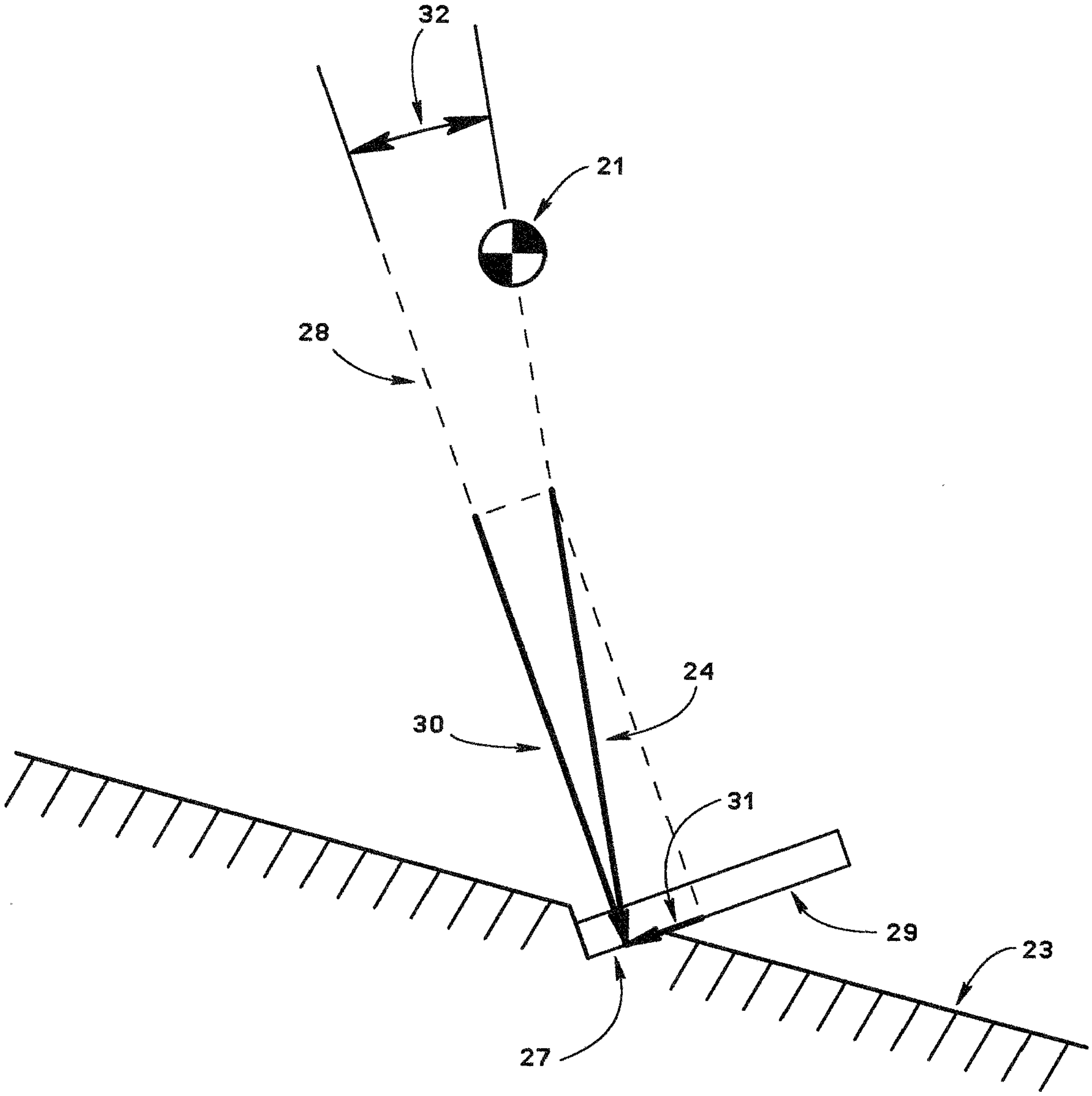

FIG. 5

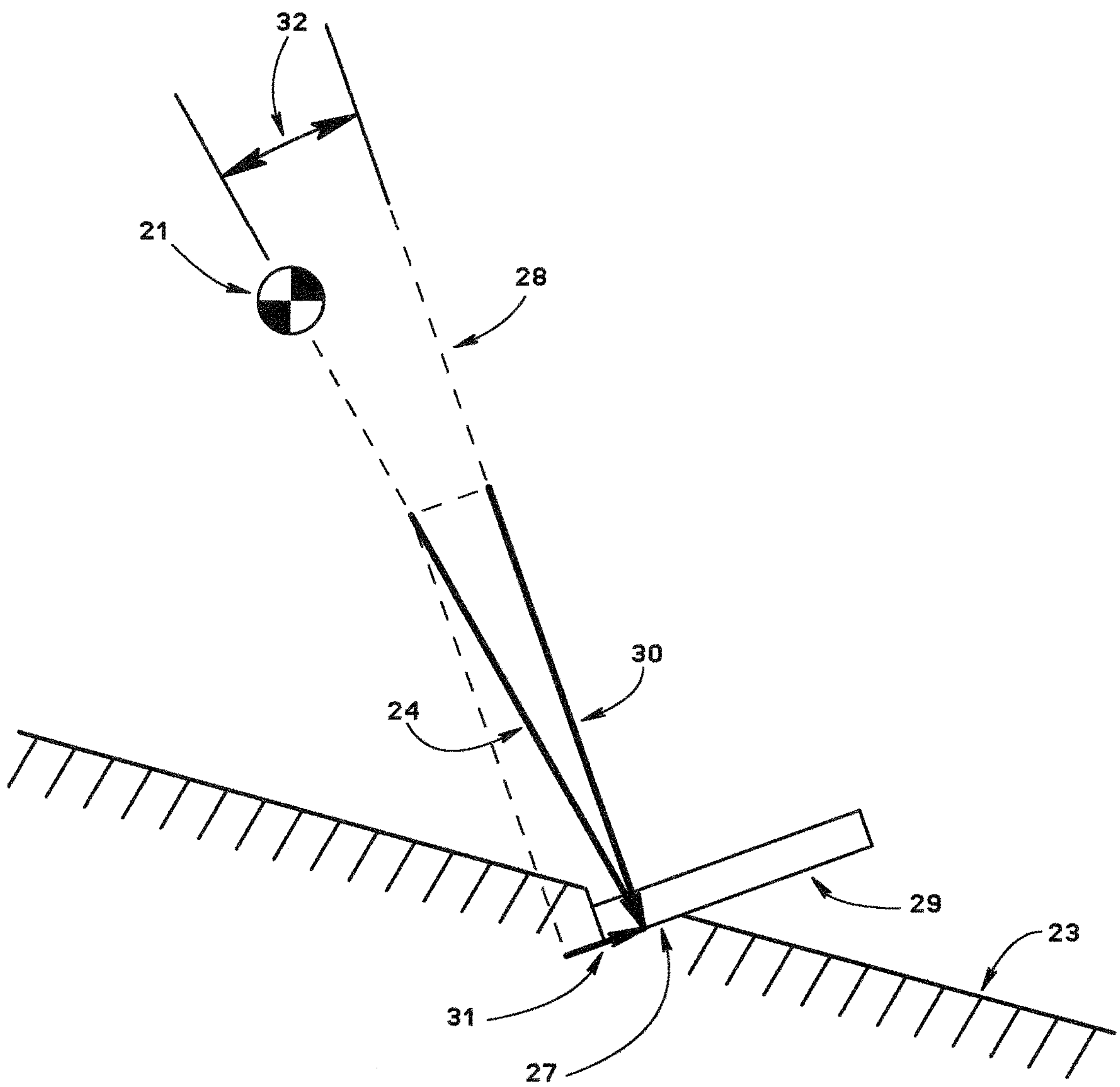

FIG. 6

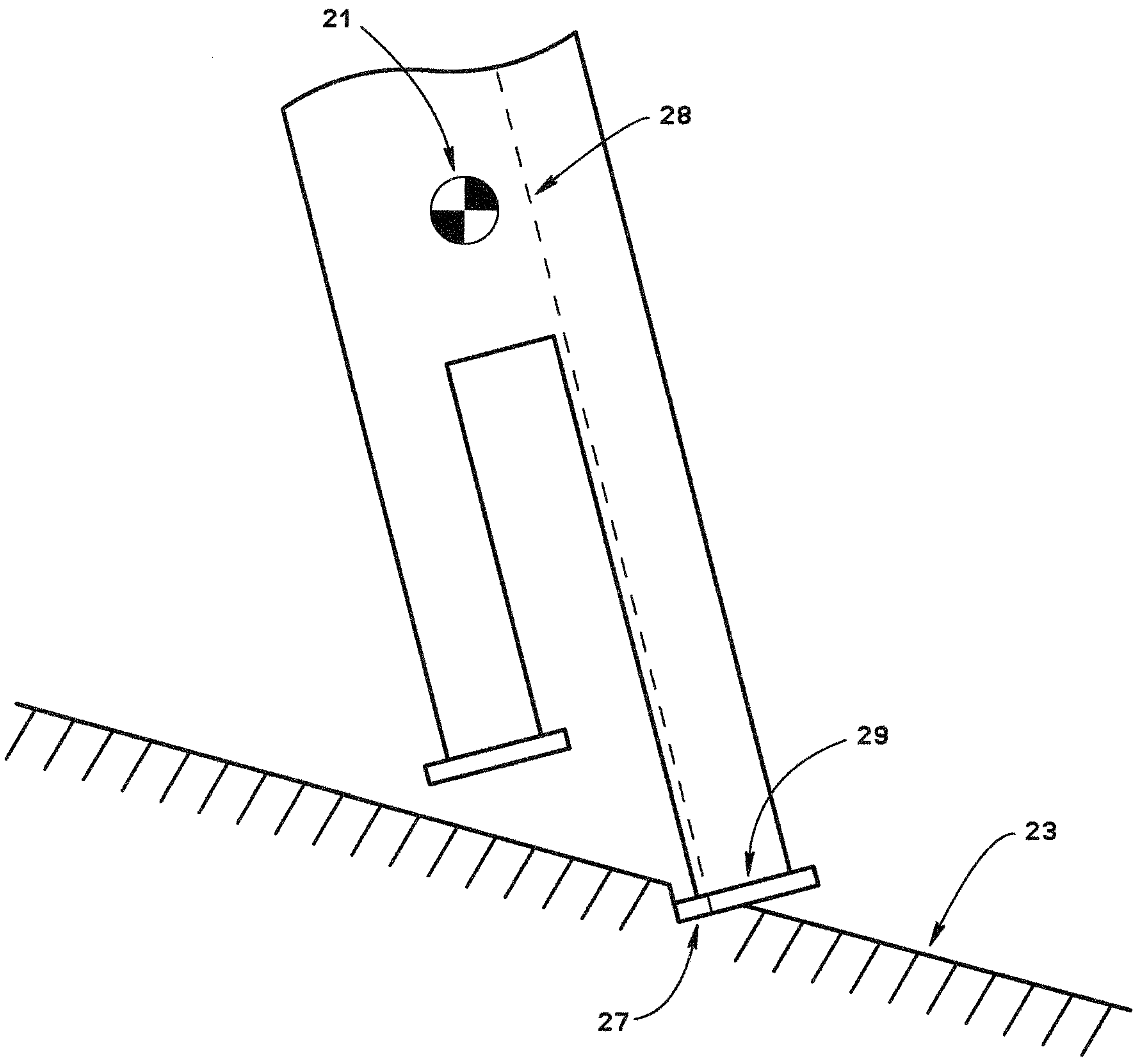

FIG. 7

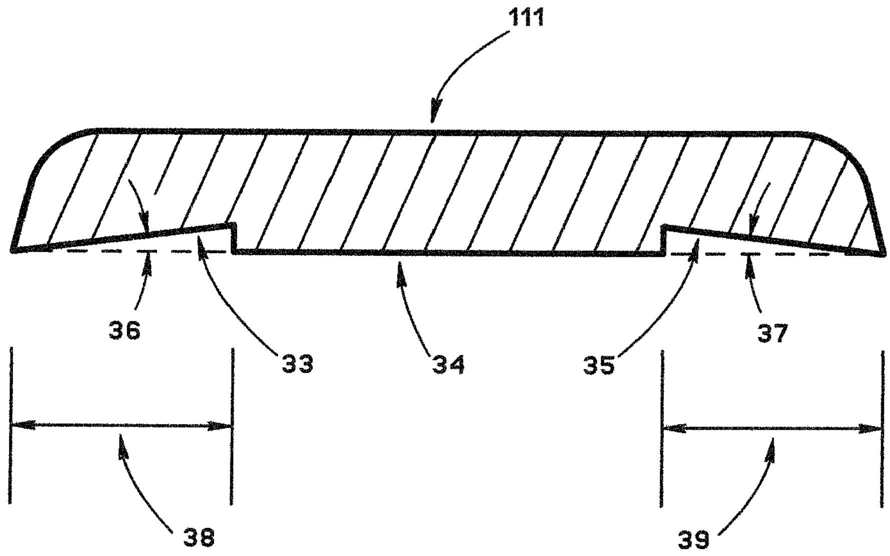

FIG. 8

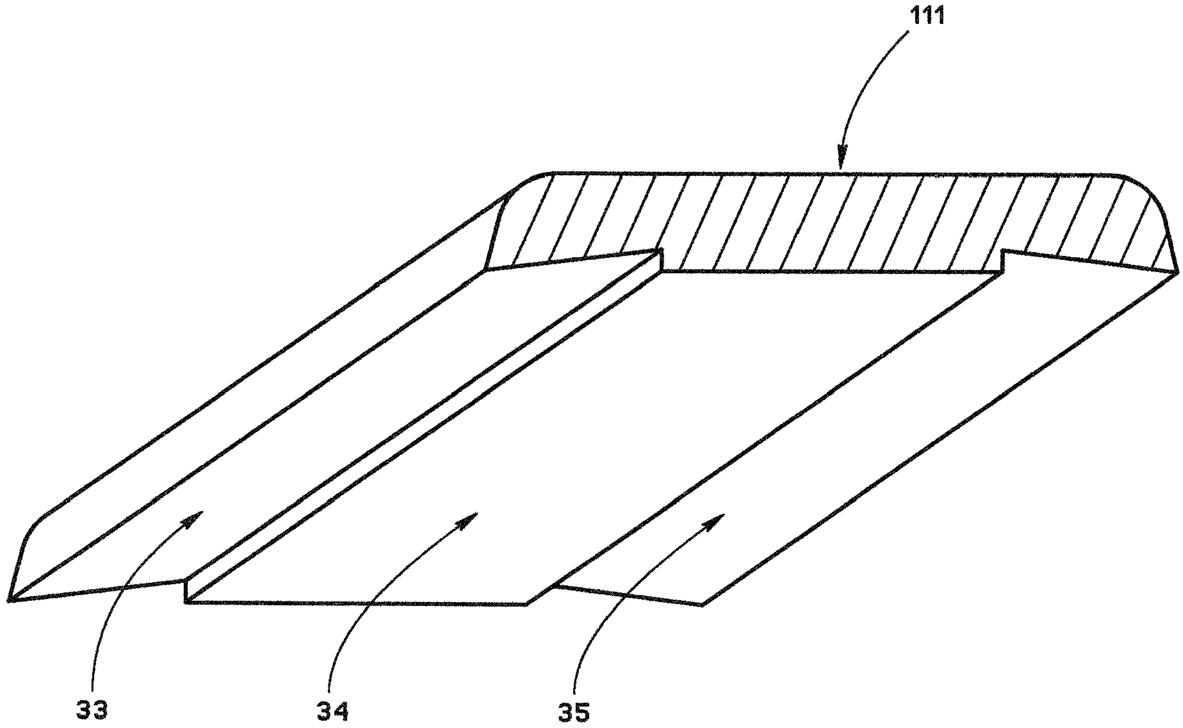

FIG. 9

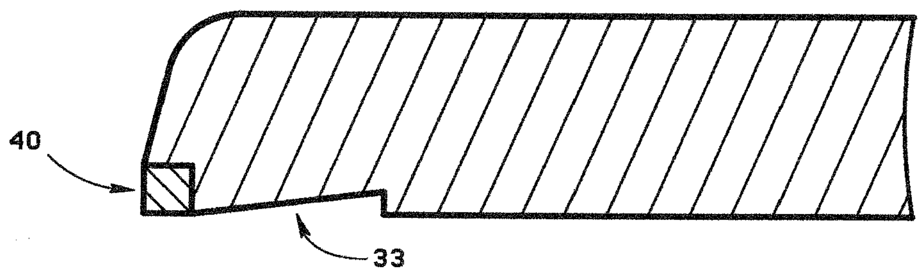

FIG. 10A

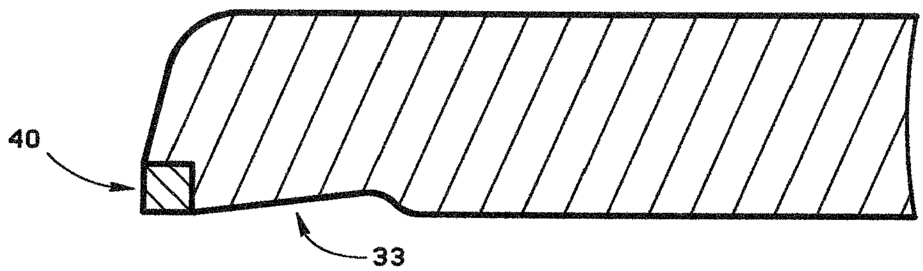

FIG. 10B

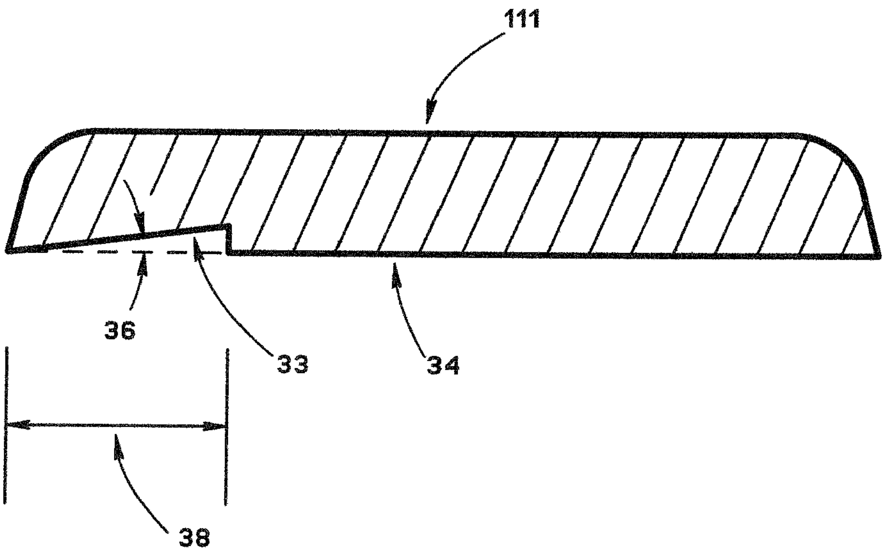

FIG. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 09 10 0194

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 197 13 198 A1 (GAMBS PETER [DE]; GAMBS MARTIN [DE]) 1 October 1998 (1998-10-01) * the whole document * -----	1,2	INV. A63C5/044 A63C5/048
Y	WO 03/095040 A (WALKER CURTIS G [CA]) 20 November 2003 (2003-11-20) * page 8, lines 5-15; figures 6-9,14B * -----	1,2	
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TECHNICAL FIELDS SEARCHED (IPC)

A63C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 June 2009	Haller, E

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17-06-2009

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REFERENCES CITED IN THE DESCRIPTION

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