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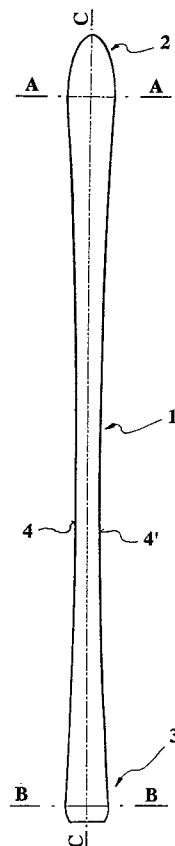
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**D-81904 München (DE)**(54) **Alpine ski.**

(57) The present invention relates to an alpine ski the sides (4, 4') of which are formed as a uniform, smooth curve whose essential feature is that it has a continuous derivative of the second order. The curve which fulfills required criteria could be an envelope of each circle of the curvature of the given curve which is performed by a skier in a given moment during steering through a turn, an arc of a circle, brachistochrone, cycloid or any combination of sine curves.

The width of the ski according to the invention at its narrowest point, i.e. in the middle section (1), lies within the range of  $63 \pm 5 \text{ mm}$ , at its widest front section (A-A) the width thereof lies within the range of  $110 \pm 10 \text{ mm}$  and at its widest rear section (B-B) the width thereof lies within the range of  $100 \pm 10 \text{ mm}$ .

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The present invention concerns an alpine ski with an upturned tip, a main section with concave curved sides and an essentially flat sliding surface. The object of the invention is classified in Class A 63C 5/00 *Int. Cl.*

An alpine ski comprising aforementioned features is known from the PCT patent application WO 92/00020 (Jørgen KARLSEN, Norway). Said known alpine ski is based on the principle that a front and a rear section, respectively, are considerably wider than the main section thereof. According to a general conception of the invention the front section at least 20 cm lengthwise of the main section has sides the lower edges of which diverge so markedly upwards and outwards to the sides in relation to the imagined straight parallel lines constituting extensions of the lower edges of the sides of the rest of the main section that at the transition between the main section and the tip, the ski has a width of 15-70%, preferably 15-50% and, best of all, a width of 20-30% greater than the width at the transition between the front section and the rest of the main section. Moreover, the lower edge of each side diverges upwards and is thereby sufficiently raised from snow to prevent cutting into the snow when the ski is positioned on its edge despite the increased ski width at the front and the rear end, respectively.

However, the solution described in WO 92/00020 has several disadvantages which are the result of said considerable widening at the front and the rear end of the ski, respectively, as well as of uneven sliding surface. At the moment of the first touch of the edge of the widened tip and tail, respectively, with snow there ensues a jerky contact of the edges therewith resulting in a sudden appearance of additional intruding external forces. In such case the ski tends to become unstable. A further disadvantage of the known solution lies in nonuniform contact of the edges along the ski with snow, which is a result of the fact that both sides of the ski are designed as a piecewise<sup>1</sup>continuous curve. As a result thereof there appears a relatively high gap between the edge of the ski and the snow ground at the moment of taking a turn, which leads to skidding of the skier and hence, to an increase of the radius of the turn which has to be taken.

With these specific problems in mind, it is a particular and primary object of the invention to provide an alpine ski of the general kind discussed in the foregoing, by which, however, the construction is further improved in a manner that the active length thereof is irrespectively of the manner and kind of skiing, i.e. nonprofessional or professional and slalom or downhill skiing, respectively, utilized to the optimum and which enables performing of a

turn on the edge of the ski with least skidding possible.

It was surprisingly proven that the given problem has been solved in that starting from the narrow middle section an alpine ski according to the invention uniformly widens in the longitudinal direction thereof towards both upturned tip and tail. Yet, with respect to the longitudinal axis of symmetry both concave sides are formed as a uniform, smooth curve whose essential feature thereof is that it has a continuous derivative of the second order.

Said smooth curve having a continuous derivative of the second order could be a part of an envelope of each circle of the curvature of the given curve which is at a given moment during steering through the turn performed by a skier, a part of an arc of a circle, brachistochrone, cycloid or a part of any combination of sine curves.

Another essential feature of the alpine ski according to the invention lies in that a uniformly increasing width thereof reaches maximum values in an extremely wide front section, i.e. in the area of the tip, and in an extremely wide rear section, i.e. in the area of the tail. Thereby the relation between the narrow middle section and the widest front section lies in a ratio of 1: 1.47 to 1: 2.07, preferably 1: 1.75, and the relation between the narrow middle section and the widest rear section lies in a ratio of 1: 1.32 to 1: 1.90, preferably 1: 1.59.

The present invention is further described in more detail with reference to the drawing, which illustrates an embodiment of an alpine ski according to the invention with its sliding surface resting e.g. on the snow ground, i.e. viewed from above.

An alpine ski according to the invention comprises a narrow middle section 1 being essentially located in the area of the standing room of the skier. The width of said ski uniformly increases in longitudinal direction, i.e. in the direction towards tip 2 as well as in the direction towards tail 3, reaching its maxima in an extremely wide front section **A-A** lying in the area of the upturned tip 1, i.e. section averted from snow, and in an extremely wide rear section **B-B** lying in the area of tail 3 of the ski. In respect to the longitudinal axis of symmetry **C-C** thereof the ski further comprises concave sides 4, 4'. Hence, said sides 4, 4' of the ski according to the invention are formed in such manner that each single point of each side 4 and 4', respectively, is arranged on a smooth, uniform curve whose essential feature is that it has a continuous derivative of the second order. According to the invention a part of an arc of a circle, brachistochrone, cycloid or a part of any combina-

1. also sectionally

tion of sine curves could be chosen as said smooth curve having a continuous derivative of the second order. Said curve of the sides 4, 4' could also be a part of an envelope of each circle of the curvature of the given curve which is performed by a skier at a given moment during steering through a turn.

However, at an alpine ski according to the invention it has been proven as advantageous if the ratio of the narrow middle section 1 and the widest front section A-A lay within a range of 1: 1.47 to 1: 2.07, preferably 1: 1.75. Additionally, the ratio of the narrow middle section 1 and the widest rear section B-B lies within range of 1: 1.32 to 1: 1.90, preferably 1: 1.59.

A specific embodiment of an alpine ski has been conceived in such manner that the width thereof at its narrowest point, i.e. in the middle section 1, lies within the range of  $63 \pm 5 \text{ mm}$ , at its widest front section A-A the width thereof lies within range of  $110 \pm 10 \text{ mm}$  and at its widest rear section B-B the width thereof lies within range of  $100 \pm 10 \text{ mm}$ .

The requirement for the curve of the sides 4, 4' to have a continuous derivative of the second order depends on the fact that at precisely defined deflection curve there is during steering through a turn assured an exact contact of the ski over its entire length with the snow ground. Since forces generated in this case distribute over the entire length of the ski this results in an extraordinary cooperation of the ski with the snow ground. Since said cooperation of the ski with the snow ground is predictable and uniform as well, a result thereof is a relatively low probability of sudden skidding of the ski aside, and at the same time an increased stability of the ski.

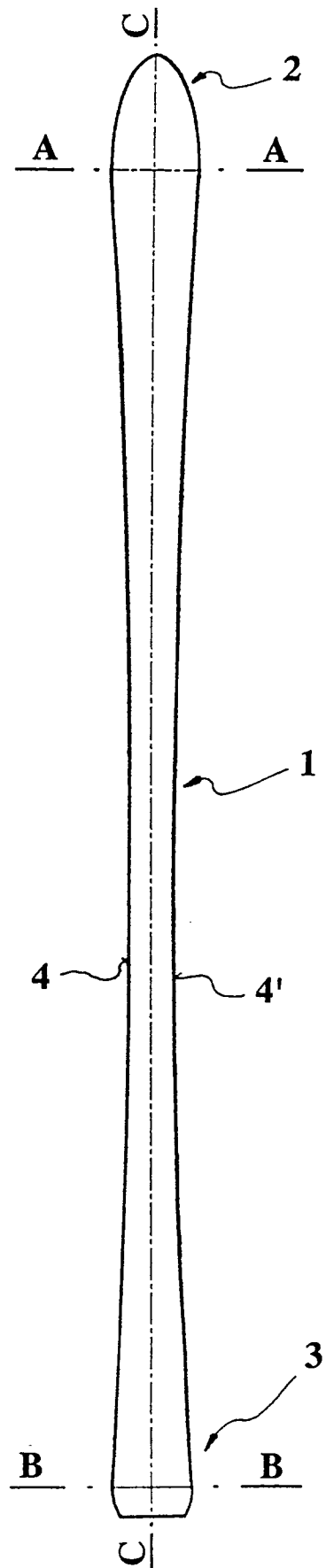
Since forces generated at skiing through the turn with an alpine ski according to the invention distribute over the entire length of the ski, as already mentioned in the foregoing, there is only a small portion of the activity necessary for the skier to perform a turn. The extreme width of the ski in the area of its tip 2 and the uniform contact of the ski with the snow ground cause an additional torque around the perpendicular line, which substantially supports the realization of the turn.

## Claims

1. An alpine ski with an upturned tip, a main section with concave curved sides and an essentially flat sliding surface, *characterized in* that starting from the narrow middle section (1) a ski uniformly widens in the longitudinal direction thereof towards both upturned tip (2) and tail (3) whereby with respect to the longitudinal axis (C-C) of symmetry both concave sides (4, 4') are formed as a uniform, smooth curve

whose essential feature is that it has a continuous derivative of the second order, and whereby a uniformly increasing width of the ski reaches maximum values in an extremely wide front section (A-A) and in the extremely wide rear section (B-B).

2. An alpine ski according to claim 1 *characterized in* that said smooth curve having a continuous derivative of the second order is a part of an envelope of each circle of the curvature of the given curve which is performed by a skier at a given moment during steering through a turn.
3. An alpine ski according to claim 1 *characterized in* that said smooth curve having a continuous derivative of the second order is a part of an arc of a circle.
4. An alpine ski according to claim 1 *characterized in* that said smooth curve having a continuous derivative of the second order is a part of a brachistochrone.
5. An alpine ski according to claim 1 *characterized in* that said smooth curve having a continuous derivative of the second order is a part of cycloid.
6. An alpine ski according to claim 1 *characterized in* that said smooth curve having a continuous derivative of the second order is a part of any combination of sine curves.
7. An alpine ski according to claims 1 to 7 *characterized in* that the relation between the narrow middle section (1) and the widest front section (A-A) lies in a ratio of 1: 1.47 to 1: 2.07, preferably 1: 1.75.
8. An alpine ski according to claims 1 to 7 *characterized in* that the relation between the narrow middle section (1) and the widest rear section (B-B) lies in a ratio of 1: 1.32 to 1: 1.90, preferably 1: 1.59.
9. An alpine ski according to claims 1 to 8 *characterized in* that the width thereof at its narrowest point, i.e. in the middle section (1), lies within the range of  $63 \pm 5 \text{ mm}$ , at its widest front section (A-A) the width thereof lies within range of  $110 \pm 10 \text{ mm}$  and at its widest rear section (B-B) the width thereof lies within the range of  $100 \pm 10 \text{ mm}$ .





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## EUROPEAN SEARCH REPORT

Application Number

EP 92 11 3343

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A-2 559 673 (CRUCIANI)	1-3,6	A63C5/00
Y	* page 2, line 18; claims 1,3; figure 3 * ---	7-9	
X	FR-A-954 679 (BEERLI) * page 2, line 21 - line 29; figure 1 * ---	1-3	
Y	DE-A-4 112 950 (ATOMIC SKIFABRIK ALOIS ROHRMOSER) * column 4, line 39 - line 48; claim 4; figure 1 * ---	7-9	
A	EP-A-0 230 126 (TRISTAR SPORTS INC.) * claim 1; figure 7 * -----	1-3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A63C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 SEPTEMBER 1993	Examiner PAPA U.I.
<b>CATEGORY OF CITED DOCUMENTS</b>			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons ..... & : member of the same patent family, corresponding document	