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• **Aaltonen, Harri**
19700 Sysma (FI)

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(74) Representative: **Heinänen, Pekka Antero et al**
Patenttitoimisto Oy Heinänen Ab
Annankatu 31 - 33 C
00100 Helsinki (FI)

(71) Applicant: **PELTONEN SKI OY**
19600 Hartola (FI)

(72) Inventors:

• **Peltonen, Matti**
19600 Hartola (FI)

(54) **A method for manufacturing a ski, particularly a cross-country ski**

(57) The invention relates to a method of manufacturing a ski, particularly a cross-country ski, comprised of an essentially integral skin part forming the top (1) and sides (2) of the ski, and of a bottom (3). The method according to the invention is implemented so that the skin part (1, 2) of the ski is laminated by resin injection

moulding so as to achieve a prefabricated skin component with an essentially finished outer surface, and the bottom laminate and plastic running surface (3) of the ski are then bonded separately to this prefabricated skin component. The invention is also related to a skin structure manufactured using this method.

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Description

The present invention relates to a method of manufacturing a ski, particularly a cross-country ski, said ski being comprised of an essentially integral skin part forming the top and sides of the ski, and of a bottom.

Glass-fiber composite skis are today made using a plurality of methods. According to one of the methods, the ski is implemented as a resin-bonded layered structure called the "sandwich" ski. Another method is based on injecting a foam core between the load-bearing laminates. This is called the resin injection method. In these two structures the sides and the top of ski are of different materials and the actual load-bearing structure is formed by the ski top layer and the glass-fiber laminates of the ski bottom.

Other methods known in the art include the filament/tape laying method that produces a composite skin structure called the "torsion box". In this method the filaments or a cloth tape are/is laminated by a wet technique about the core section of the ski. The sides are of the same load-bearing material as the top and bottom laminates. Additionally known in the art is a manufacturing method for a skin ski in which the top and the sides of the ski form an integral load-bearing structure to which during the lamination step is joined a plastic skin covering the entire ski and having a graphic ornamentation of the ski surface prefabricated by different methods thereon. Such skin skis can be manufactured using any of the above-described fabrication methods.

A benefit of the skin ski is its easy graphic ornamentation and simple finishing at the final step of manufacturing. A problem related to the conventional manufacturing methods for skin skis is how to join the skin of the ski to the top-and-side laminate part of the ski with a sufficient bonding strength to each other so that no glide-degrading sharp edge will be formed between the ski's side and bottom.

It is an object of the present invention to provide a method for manufacturing a novel type of skin ski structure in a fashion that makes the ski structure free from the above-described drawbacks. This goal is attained by means of the present invention characterized in that the skin part of the ski is laminated by resin injection moulding so as to achieve a prefabricated skin component with an essentially finished outer surface, and the bottom laminate and the plastic running surface of the ski are then bonded separately to this prefabricated skin component.

An embodiment of the method according to the invention is characterized in that in the resin injection moulding step the reinforcing fibers are impregnated with the resin in a separate skin mould so that during setting the resin used therein forms a smooth, high-luster and durable outer skin of the ski, whereby also the graphic ornamentation of the ski can be embedded in the skin already at the resin injection step.

Another embodiment of the method according to

the invention is characterized in that the space remaining inside the skin part of the ski is filled during the bonding step of the ski bottom entirely or partially with a different kind of material such as foam, wood or honeycomb core for the purpose of improving or controlling the stiffness of the ski structure.

Furthermore, the invention is related to a ski, particularly a cross-country ski comprised of an essentially integral skin part forming the top and sides of the ski, and of a bottom, said ski being characterized in that the skin part of the ski is manufactured by the resin injection moulding method in a skin part mould and to the prefabricated skin part are the bottom laminate and plastic running surface of the ski then bonded separately.

An embodiment of the ski according to the invention is characterized in that the mould of the skin part is shaped so as to have the lower edges of the ski sides bevelled inward.

Another embodiment of the ski according to the invention is characterized in that the space remaining inside the skin part of the ski is filled during the bonding step of the ski bottom entirely or partially with a different kind of material such as foam, wood or honeycomb core for the purpose of improving or controlling the stiffness of the ski structure.

The invention provides a plurality of benefits, one of which to be mentioned is that the graphic ornamentation of the ski skin can be implemented during the resin injection step, which means that no separate skin need be bonded over the load-bearing glass fiber structures. Owing to the inward bevelling of the lower side edges of the skin part, no sharp lower edges will be formed that could degrade the glide performance of the ski, and moreover, strength calculations prove that the larger bonding area thus obtained is sufficient to impart a high structural strength to the ski. During the lamination step of the skin part, the number of laminates used in the structure may be varied widely, in practice almost infinitely, whereby the desirable properties of the ski can be controlled very accurately.

In the following the invention will be examined in greater detail with reference to the appended drawing illustrating the cross section of a ski according to the invention.

The ski according to the invention is comprised of a skin part formed by a top 1 and sides 2, and of a bottom 3 bonded thereto. The skin is manufactured using a method comprised of the steps of first laminating the skin part 1, 2 of the ski using a resin injection method known in the art from other applications as the resin transfer moulding, or the RTM method in which the reinforcing fibers are impregnated in a separate skin mould with a resin so that during the setting of the resin a smooth, high-luster and durable outer skin of the ski is formed, whereby also the graphic ornamentation of the ski can be embedded in the skin already during the resin injection step. To the half-box skin structure 1, 2 thus obtained are the bottom laminate and plastic run-

ning surface 3 of the ski then bonded separately.

As is evident from the diagram, the lower side edges 2' of the skin part 1, 2 are bevelled inward, whereby no sharp lower edges will be formed that could degrade the glide performance of the ski particularly in the skating style of skiing, and moreover, a sufficiently large bonding area between the skin and the bottom is thus obtained to impart a high structural strength to the ski.

During the lamination step of the skin part 1, 2, the number of laminates used in the structure may be varied widely, in practice almost infinitely, whereby the desirable properties of the ski can be controlled very accurately.

The space remaining inside the skin part 1, 2 is filled during the bonding step of the ski bottom 3 as desired either entirely or partially with a different kind of material 4 such as foam, wood or honeycomb core for the purpose of further improving or controlling the stiffness of the ski structure.

To those versed in the art it is obvious that the invention is not limited to the exemplifying embodiment described above, but rather, can be varied within the scope of the annexed claims.

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Claims

1. A method of manufacturing a ski, particularly a cross-country ski, said ski being comprised of an essentially integral skin part forming the top (1) and sides (2) of the ski, and of a bottom (3), **characterized** in that

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- the skin part (1, 2) of the ski is laminated by resin injection moulding so as to achieve a prefabricated skin component with an essentially finished outer surface, and

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- the bottom laminate and plastic running surface (3) of the ski are then bonded separately to this prefabricated skin component.

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2. A method as defined in claim 1, **characterized** in that in the resin injection moulding step the reinforcing fibers are impregnated with the resin in a separate skin mould so that during setting the resin used therein forms a smooth, high-luster and durable outer skin of the ski, whereby also the graphic ornamentation of the ski can be embedded in the skin already at the resin injection step.

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3. A method as defined in claim 1 or 2, **characterized** in that the space remaining inside the skin part (1, 2) is filled during the bonding step of the ski bottom (3) entirely or partially with a different kind of material (4) such as foam, wood or honeycomb core for the purpose of improving or controlling the stiffness of the ski structure.

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4. A ski, particularly a cross-country ski comprised of an essentially integral skin part forming the top (1) and sides (2) of the ski, and of a bottom (3), **characterized** in that the skin part (1, 2) of the ski is manufactured by the resin injection moulding method in a skin part mould and to the prefabricated skin part are the bottom laminate and plastic running surface (3) of the ski then bonded separately.

5. A ski as defined in claim 4, **characterized** in that the mould of the skin part (1, 2) is shaped so as to have the lower edges (2') of the ski sides (2) bevelled inward.

5. A ski as defined in claim 4 or 5, **characterized** in that the space remaining inside the skin part (1, 2) is filled during the bonding step of the ski bottom (3) entirely or partially with a different kind of material (4) such as foam, wood or honeycomb core for the purpose of improving or controlling the stiffness of the ski structure.

