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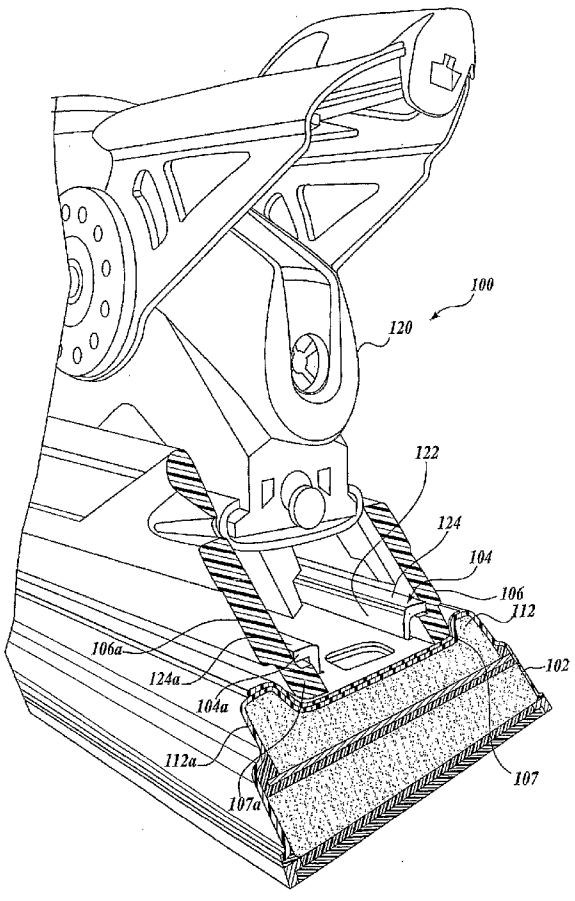
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(54) Title: SKI BINDING SYSTEM

(57) Abstract: Embodiments of the invention relate to a binding (120), and in particular to a ski binding (120), wherein the binding (120) is directly contacting the ski (102), but is still capable of sliding longitudinally on the ski (102) to reduce stiffness. The intimate contact of the binding (120) with the ski (102) allows for optimum transfer of power between the ski (102) and the skier.



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SKI BINDING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 60/742,647, filed December 6, 2005, the benefit of which is hereby claimed under 35 U.S.C. § 119.

FIELD OF THE INVENTION

The present invention is related to sports equipment, and specifically, to a binding system for skis.

BACKGROUND OF THE INVENTION

Ski bindings are used to connect a ski boot to a ski. A conventional ski binding has a forward engagement member and a rear engagement member connected to one another by a rigid platform against which the boot rests. The platform is typically connected to the ski via mechanical fasteners, such as screws or bolts, on the forward and rear portions of the ski so that the binding is fixed rigidly to the ski. A ski boot will typically have a forward member that engages with the corresponding forward member of the binding system. The ski boot will also have a rear member that engages the corresponding rear member of the ski binding. The skier plants the forward portion of the boot into the forward member of the binding, and places his or her weight on the heel of the boot to clasp with the rear member of the binding. The forward and rear members of the binding system are rigidly fixed to the ski via the platform so as not to move forwards and backwards while skiing. As forces compel the ski to flex or bend, the rigid binding system prevents the ski from bending in the area covered by the ski binding. The conventional binding system, therefore, opposes the natural tendency of the ski to bend, and creates stiffness in the ski, which defeats a design purpose of the ski.

SUMMARY OF THE INVENTION

In one embodiment, the present invention relates to a binding system, wherein the binding is directly contacting the ski surface, but is still capable of sliding longitudinally on the ski to reduce stiffness between the boot and the binding during bending of the ski. The intimate contact of the binding with a side wall of a ski and/or the top of the ski surface allows for optimum transfer of power between the ski and the skier. As the ski bends, portions of the binding system are allowed to slide in relation to the ski so as to

not interfere with the bending of the ski. The ski binding in accordance with one embodiment of the present invention, therefore, reduces stiffness, as compared to the conventional binding systems.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a diagrammatical illustration of a cross section of a ski and a binding system in accordance with one embodiment of the present invention;

FIGURE 2 is a diagrammatical illustration of a ski with brackets and a binding with sliding shoes that fit in the brackets in accordance with one embodiment of the present invention; and

FIGURE 3 is a diagrammatical illustration of a cross-section of a ski with brackets.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGURE 1 is a diagrammatical illustration of a ski binding system 100 in accordance with one embodiment of the present invention. The ski binding system 100 comprises a ski binding portion 120 that receives a boot and brackets 104 on the ski 102 to which the binding is attached. The binding system 100 is for binding or holding the ski binding portion 120 to the ski 102 and is provided with means for holding the ski binding 120 to the ski 102 that allows the ski 102 to flex or bend in the area of the ski binding 120 and also beneath the ski binding 120 and for further transferring the lateral forces from the ski binding 120 to the ski 102. The ski binding system 100 includes at least one bracket 104 that projects from the upper surface of the ski 102. In one embodiment, the bracket 104 has a generally upright standing beam 122 aligned lengthwise on the ski 102 with an overhanging ledge 124 that accepts a structure beneath the ledge 124. In the particular embodiment shown, the ledge 124 is facing outward. The ski 102 has a second bracket 104a on the opposite side of the centerline of the ski 104, wherein the ledge 124a faces in the opposite direction as the ledge 124. Thus, the beam 122 may prevent side to side or lateral movement, and the ledge 124 may prevent upward or vertical movement. A raised sidewall 112 is provided adjacent to the bracket 104 between the bracket 104 and an upper edge of the ski 104. The sidewall 112a

is adjacent to bracket 104a. The sidewalls 112 and 112a rise above the surface of the ski 102. Thus, the space between the brackets 104 and 104a and the corresponding sidewalls 112 and 112a define channels therebetween for receiving sliding shoes 106 and 106a that allows movement of the sliding shoes 106 and 106a lengthwise along the ski 102, but are prevented from moving side to side or vertically. The sliding shoes 106 and 106a are attached to the binding portion 120 that receives and holds the ski boot. The sliding shoes 106 and 106a have block-shaped sections 107 and 107a that fit within the channels created by the respective brackets 104, 104a and sidewalls 112, 112a. The sliding shoes 106 and 106a may not extend to or touch against the standing beams of the brackets 104 and 104a, so that any lateral force, such as any force compelling the binding 120 to the outside, is borne by the sides of the sliding shoes 106 or 106a hitting, abutting or touching against the sidewalls 112 or 112a. Similarly, the sliding shoes 106 and 106a may not touch the narrow edges of the ledges 124 and 124a so that the ledges 124 and 124a may not bear a great majority of the side forces. The brackets 104 and 104a primarily bear the upward or vertical forces, while the sidewalls 112 and 112a bear all or the majority of the side forces for the ski 102. The shoes 106 and 106a primarily bear the majority of the upward or vertical forces and the side or lateral forces for the binding portion 120. Although one embodiment of a bracket has been illustrated, it is to be appreciated, that brackets having other configurations may be provided as well. For example, another embodiment is a rail on the centerline of the ski having a beam lengthwise along the ski and having two ledges that project laterally to either side of the centerline from the top of the beam to form a "T" member.

The sliding shoes 106 and 106a are included in the binding system 100, which is not shown for clarity and brevity. The sliding shoes 106 and 106a have a block-shaped section 107 and 107a that engages the channel between the brackets 104, 104a and the sidewalls 112, 112a at the top surface of the ski 102. In this manner, the sliding shoes 106, 106a are captured between the respective sidewall 112 or 112a and the bracket 104 or 104a. As can be appreciated, the sliding shoes 106 and 106a make direct contact with the ski 102 either through the sidewalls 112, 112a the top layer 108, or both. This arrangement provides insubstantial lateral and medial side to side movement of the sliding shoes 106 and 106a and consequently the ski binding 120 because of direct contact of the binding system via the sliding shoes 106, 106a with the sidewalls 112 and 112a, but provides longitudinal lengthwise movement forwards and backwards of the

sliding shoes 106 and 106a in relation to the ski 102, and therefore, the attachment transfers power from the brackets 106, 106a to the ski 102, via the brackets 104, 104a and the sidewalls 112 and 112a. Further, the underside of the ledges 124 and 124a of brackets 104 and 104a are engaged with the top side of the block-shaped sections 107 and 107a to prevent insubstantial vertical movement between the binding system 100 and the ski 102. The inner surface of sidewall 112 abuts against the outer surface of block-shaped section 107 of sliding shoe 106 to provide direct contact and efficient power transfer from the skier to the ski 102. Similarly, the inner surface of the sidewall 112a abuts against the outer surface of the block-shaped section 107 of sliding shoe 106a. However, other power transfer structures besides a sidewalls 112 and 112a can be provided, such as longitudinal channels, rails or ribs along the medial, lateral or centerline of the ski 102. Additionally, because the interlocking, sliding portions of the brackets 104, 104a and the sliding shoes 106, 106a allow movement lengthwise, the ski binding 120 is capable of sliding, at least partially, at one or both ends, when the ski bends allowing longitudinal movement in a forwards and backwards direction during skiing. Stops can be provided that prevent the sliding shoes 106 and 106a from completely disengaging from the brackets 104 and 104a when run out to the very end. Further, the sliding shoes 106 and 106a can be temporarily affixed at one position on the ski 102 and may be adjustable by placing the stops in one of a plurality of adjustment holes. One location of the binding system can be rigidly fixed to the ski 102, so that the remainder of the binding is free to slide. For example, the binding system 100 can be affixed to the ski 102 at the heel or rear portion. The toe or front portion of the binding 100 is then free to slide as the ski 102 flexes and bends, thus, reducing the stiffness of the ski in comparison to the conventional ski binding. Alternatively, the toe or front portion of the binding system can be fixed to the ski, while the heel or rear portion of the binding system is allowed to slide lengthwise. Such total amount of sliding movement can be designed to have a travel range of about 5 to about 10 mm, or about 6 to about 9 mm, or about 7 to about 8 mm. However, other embodiments can have travel limits outside of these ranges. Generally, the more stiff a ski is, the less sliding travel is needed. One embodiment of a stop device can be a pin that blocks the sliding shoes 106 from moving forwards or backwards in relation to the length of the ski 102. Such pins can be spring activated to remain in a locked position, and then, be unlocked by a skier to allow the skier to adjust the position of the binding system in relation to the ski. Such

adjustments are advantageous when, for example, after completing a particular ski course, the skier may decide that the binding system is too far forwards or backwards for the course, and then, can easily relocate the binding system in relation to the ski for improved performance on the course.

FIGURE 2 is a diagrammatical illustration of the ski 102 including a plurality of brackets 104 and the sidewall 112 in accordance with one embodiment of the present invention. The ski 102 includes two pairs of forward brackets 104 at about the midpoint the length of the ski 102 and two pairs of rear brackets 104 at about one quarter from the end of the ski 102. There is a lateral bracket 104 and a medial bracket 104 comprising each pair. However, fewer or more brackets may be used. A sidewall 112 is provided adjacent to both sides of each pair of brackets 104. Sidewalls 112 function to transfer loads from the binding to the ski 102 as described above.

FIGURE 3 is a diagrammatical illustration of a cross section of the ski 102 in accordance with one embodiment of the present invention. The ski 102 has been cut to show the details of the attachment of the binding system 100 to the ski 102, and, in particular, the attachment of the bracket 104 to the ski 102. In one embodiment, a single piece of metal comprises both lateral 104 and medial 104a brackets. A cross member 110 that lies beneath the top surface of the ski 102 connects the lateral bracket 104 to the medial bracket 104a. In one embodiment, the brackets 104 and 104a are attached to the ski 102 by overlaying a section of the cross member 110 with resin and/or fabric 108 that forms the top layer of the ski 102. The ski 102 can be constructed having a core, a reinforcement layer, and one or more top sheets. Bracket and sliding shoe materials can include metals, rigid plastics, laminates, carbon fiber composites, resin composites, and the like.

A series of discrete brackets 104 can be provided along the length of the ski 102, so that several discrete brackets 104 can be placed along the length of the ski 102. Alternatively, one continuous rail can be used in place of a series of discrete brackets 104. One bracket 104 can be located on the lateral or medial side of the centerline of the ski 102, and a second bracket 104a can be placed on the opposite side of the centerline and facing opposite to the first bracket 104. In the following description, a representative bracket 104 will be described for brevity. It being understood that other brackets have similar structure, but may be placed in the opposite direction depending on which side of the centerline the brackets are located. In one embodiment, the

brackets 104 have a substantially upright long beam 122 that extends from the top layer 108 of ski 102. The upright long beam 122 is substantially perpendicular (when viewed end on) to the top layer 108. The upright beam 122 is bent at a substantially right angle to the upright beam forming the ledge 124, so as to define a channel 126 beneath the ledge 124 so that a corresponding member can slide forwards and backwards within the channel 126. In one embodiment, the ski 102 is provided with two ledges that raised a small amount above the upper surface of the ski 102 and the ledges face outward. In another embodiment, the ledges may be facing inward (i.e., toward the centerline of the ski 102). Alternatively, in another embodiment as described above, a single rail can be used that can be located, for example, at the centerline of the ski, such that the single beam has both lateral and medial ledges. Further, as can be seen in FIGURE 3, the brackets 104 are connected and rigidly attached to the ski 102 via the cross member 110 that spans the medial and lateral brackets. The cross member 110 is embedded within the top layer 108 of the ski 102. The top layer 108 can be woven or non-woven fiber-reinforced glass or a plastic, and resin. One method of attaching the brackets 104 and 104a is through the use of technology known under the designation "MOD." This technology is described in U.S. Patent Nos. 6,851,699, February 8, 2005; 6,612,605, September 2, 2003; and 6,520,529, February 18, 2003. Alternatively, other methods of connecting brackets 104 to ski 102 can be employed, for example, mechanical fasteners, such as screws, pins, and rivets.

Embodiments of the invention relate to systems for holding a ski binding to a ski including means for holding the ski binding to the ski and for transferring lateral forces from the binding to the ski while allowing the ski to flex or bend in the area of the ski binding.

In a first embodiment, the means for holding and for transferring lateral forces comprises one or more brackets on the upper surface of the ski and shoes that fit into the brackets on the lower surface of the ski binding.

In a second embodiment, the means for holding and for transferring lateral forces comprises a bracket on the upper surface of the ski and a shoe on the lower surface of the ski binding, wherein the bracket and shoe have ledges that slide relative to each other.

In a third embodiment, the means for holding and for transferring lateral forces comprises a first and second bracket on the upper surface of the ski and a first and second shoe on the lower surface of the ski binding, wherein the first bracket is located on one

side of the centerline of the ski and the second bracket is located on the opposite side of the centerline of the ski, and the first shoe is located on one side of the centerline of the ski binding and the second shoe is located on the opposite side of the centerline of the ski.

In a fourth embodiment, the means for holding and for transferring lateral forces comprises a first bracket and a second bracket on the upper surface of the ski and a first shoe and a second shoe on the lower surface of the ski binding at one end of the binding, wherein the first and second brackets engage, respectively, with the first and second shoes to prevent movement vertically and laterally and allow the ski to move lengthwise at least on one end of the ski binding.

In a fifth embodiment, the means for holding and for transferring lateral forces comprises a first bracket and a second bracket on the upper surface of the ski and a first shoe and a second shoe on the lower surface of the ski binding, wherein the first and second brackets engage, respectively, with the first and second shoes so that the ski binding is constrained from movement in both the vertical and lateral direction and is free to move lengthwise to allow the ski to bend or flex beneath the ski binding.

In a sixth embodiment, the means for holding and for transferring lateral forces comprises a first bracket and a second bracket on the upper surface of the ski and a first shoe and a second shoe on the lower surface of the ski binding, wherein the first and second brackets engage, respectively, with the first and second shoes so that the ski binding is constrained from vertical and lateral movement and is free to move lengthwise, wherein the brackets comprise an upright standing beam and a ledge connected lengthwise to the standing beam to allow lengthwise sliding movement.

In the embodiments above, the means for holding and for transferring lateral forces may further include at least one shoe slidingly received within a bracket or rail affixed to the ski, wherein the shoe transfers lateral forces to the ski by hitting or touching against a portion of the ski.

In the embodiments above, the means for holding and for transferring lateral forces may further include at least one shoe slidingly received within a bracket or rail affixed to the ski, wherein the shoe transfers lateral forces to the ski by abutting against a raised wall of the ski.

In the embodiments above, the means for holding and for transferring lateral forces may further include a portion of the ski binding making sliding contact with a portion of the ski to provide for the transfer of lateral forces from the binding to the ski.

In the embodiments above, the means for holding and for transferring lateral forces may further include a shoe on the ski binding that slides within a bracket or rail affixed to the ski, wherein the shoe resists the lateral and vertical forces.

In the embodiments above, the means for holding and for transferring lateral forces may further include the front end of the ski binding being fixed relative to the ski and the rear end of the binding being free to move lengthwise relative to the ski.

In the embodiments above, the means for holding and for transferring lateral forces may further include the rear end of the ski binding being fixed relative to the ski and the front end of the binding being free to move lengthwise relative to the ski.

In the embodiments above, the means for holding and for transferring lateral forces may further include the ski being free to flex in the area beneath the ski binding.

In the embodiments above, the means for holding and for transferring lateral forces may further include one end of the ski binding being fixed relative to the ski, and the other end of the binding being free to travel so that the ski is free to bend or flex in the area of the ski binding.

In the embodiments above, the means for holding and for transferring lateral forces may further include stop means for stopping movement of the ski binding at a predetermined position.

In the embodiments above, the means for holding and for transferring lateral forces may further include the position of the ski binding being adjustable on the ski.

In another aspect, a ski is characterized in that it includes any one of the ski binding systems described above. A ski and binding combination includes a ski; a bracket attached to the upper surface of the ski, wherein the ski has a sidewall adjacent to the bracket to define a lengthwise channel between the bracket and the sidewall; a binding; and a shoe connected to the binding, wherein the shoe fits between the bracket and the sidewall in a sliding engagement so that the shoe is prevented from lifting and the shoe side hits or abuts against the sidewall to transfer lateral forces from the binding to the ski. A ski and binding combination can include a first and a second bracket, wherein the first bracket is on one side of the lengthwise centerline of the ski, and the second bracket is on the opposite side of the centerline of the ski. The ski can include a first and second sidewall adjacent to the first and second brackets and the binding includes a first and a second shoe that slidingly engage the first and the second bracket, respectively, between the brackets and the sidewalls to prevent the binding from lifting and to transfer

lateral forces from the binding to the ski and to allow the ski to flex or bend in the area of the binding.

While the preferred embodiment of the invention has been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention.

CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A system for holding a ski binding to a ski, comprising means for holding the ski binding to the ski and for transferring lateral forces from the binding to the ski while allowing the ski to flex or bend in the area of the ski binding.

2. The system of Claim 1, wherein the means for holding and for transferring lateral forces comprises one or more brackets on the upper surface of the ski and shoes that fit into the brackets on the lower surface of the ski binding.

3. The system of Claim 1, wherein the means for holding and for transferring lateral forces comprises a bracket on the upper surface of the ski and a shoe on the lower surface of the ski binding, wherein the bracket and shoe have ledges that slide relative to each other.

4. The system of Claim 1, wherein the means for holding and for transferring lateral forces comprises a first and second bracket on the upper surface of the ski and a first and second shoe on the lower surface of the ski binding, wherein the first bracket is located on one side of the centerline of the ski and the second bracket is located on the opposite side of the centerline of the ski, and the first shoe is located on one side of the centerline of the ski binding and the second shoe is located on the opposite side of the centerline of the ski.

5. The system of Claim 1, wherein the means for holding and for transferring lateral forces comprises a first bracket and a second bracket on the upper surface of the ski and a first shoe and a second shoe on the lower surface of the ski binding at one end of the binding, wherein the first and second brackets engage, respectively, with the first and second shoes to prevent movement vertically and laterally and allow the ski to move lengthwise at least on one end of the ski binding.

6. The system of Claim 1, wherein the means for holding and for transferring lateral forces comprises a first bracket and a second bracket on the upper surface of the ski and a first shoe and a second shoe on the lower surface of the ski binding, wherein the

first and second brackets engage, respectively, with the first and second shoes so that the ski binding is constrained from movement in both the vertical and lateral direction and is free to move lengthwise to allow the ski to bend or flex beneath the ski binding.

7. The system of Claim 1, wherein the means for holding and for transferring lateral forces comprises a first bracket and a second bracket on the upper surface of the ski and a first shoe and a second shoe on the lower surface of the ski binding, wherein the first and second brackets engage, respectively, with the first and second shoes so that the ski binding is constrained from vertical and lateral movement and is free to move lengthwise, wherein the brackets comprise an upright standing beam and a ledge connected lengthwise to the standing beam to allow lengthwise sliding movement.

8. The system of any one of Claims 1 to 7, wherein the means for holding and for transferring lateral forces comprises at least one shoe slidingly received within a bracket or rail affixed to the ski, wherein the shoe transfers lateral forces to the ski by abutting against a portion of the ski.

9. The system of any one of Claims 1 to 7, wherein the means for holding and for transferring lateral forces comprises at least one shoe slidingly received within a bracket or rail affixed to the ski, wherein the shoe transfers lateral forces to the ski by abutting against a raised wall of the ski.

10. The system of any one of Claims 1 to 7, wherein a portion of the ski binding makes sliding contact with a portion of the ski to provide for the transfer of lateral forces from the binding to the ski.

11. The system of any one of Claims 1 to 7, wherein the means for holding and for transferring lateral forces comprises a shoe on the ski binding that slides within a bracket or rail affixed to the ski, wherein the shoe resists the lateral and vertical forces.

12. The system of any one of Claims 1 to 7, wherein the front end of the ski binding is fixed relative to the ski and the rear end of the binding is free to move lengthwise relative to the ski.

13. The system of any one of Claims 1 to 7, wherein the rear end of the ski binding is fixed relative to the ski and the front end of the binding is free to move lengthwise relative to the ski.

14. The system of any one of Claims 1 to 7, wherein the ski is free to flex in the area beneath the ski binding.

15. The system of any one of Claims 1 to 7, wherein one end of the ski binding is fixed relative to the ski, and the other end of the binding is free to travel so that the ski is free to bend or flex in the area of the ski binding.

16. The system of any one of Claims 1 to 7, further comprising stop means for stopping movement of the ski binding at a predetermined position.

17. The system of any one of Claims 1 to 7, wherein the position of the ski binding is adjustable on the ski.

18. A ski comprising the system of any one of Claims 1 to 7.

19. A ski and binding combination comprising:

(a) a ski;

(b) a bracket attached to the upper surface of the ski, wherein the ski has a sidewall adjacent to the bracket to define a lengthwise channel between the bracket and the sidewall; and

(c) a binding having a sliding shoe, wherein the shoe fits in the channel between the bracket and the sidewall in a sliding engagement so that the shoe is prevented from lifting and the shoe side hits or abuts against the sidewall to transfer lateral forces from the binding to the ski.

20. The ski and binding combination of Claim 19, wherein the ski includes a first and a second bracket, wherein the first bracket is on one side of the lengthwise centerline of the ski, and the second bracket is on the opposite side of the centerline of the ski, the ski includes a first and second sidewall adjacent to the first and second brackets and the binding includes a first and a second shoe that slidingly engage the first and the second bracket, respectively, between the brackets and the sidewalls to prevent the

binding from lifting and to transfer lateral forces from the binding to the ski and to allow the ski to flex or bend in the area of the binding.

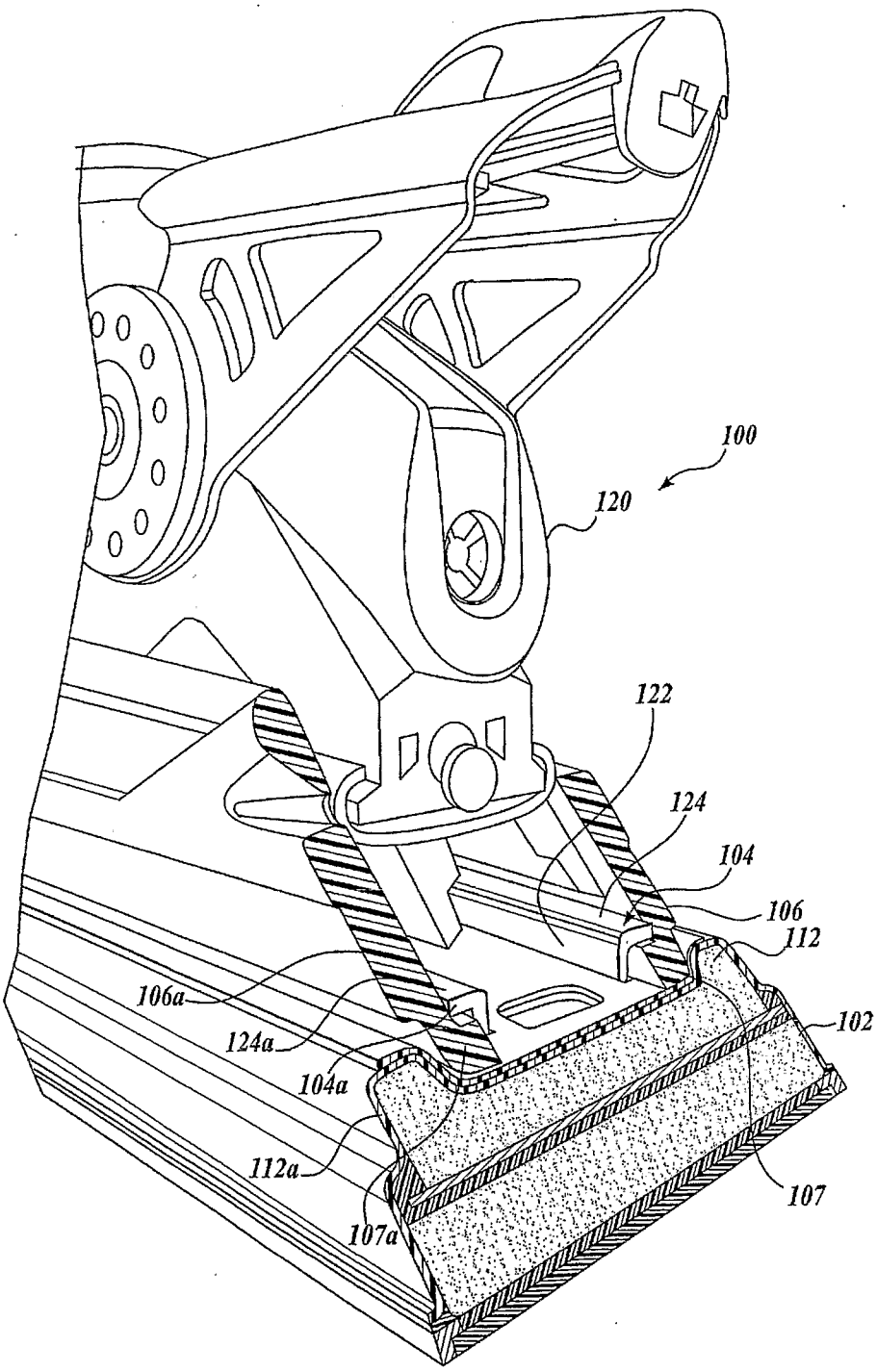


Fig.1.

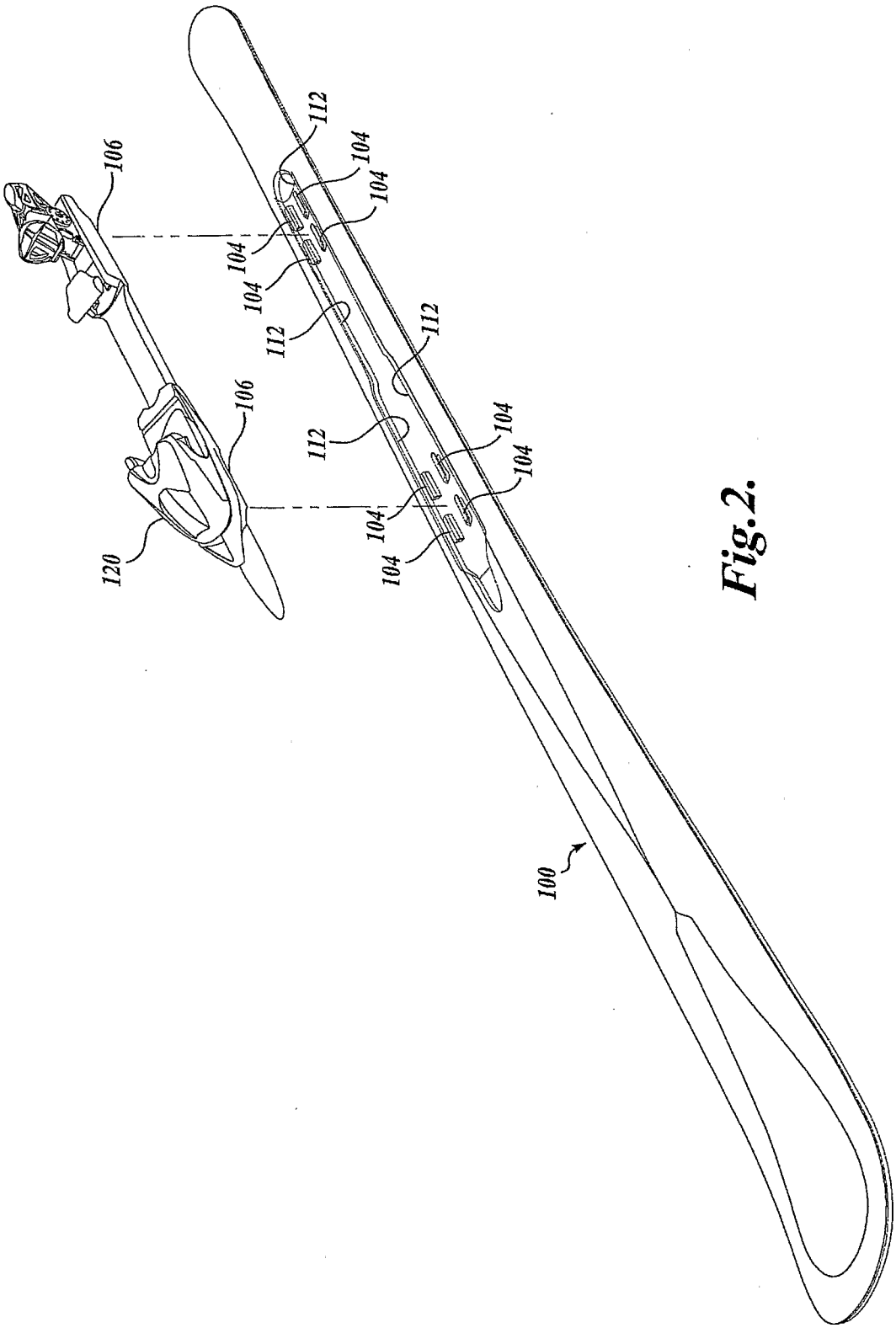


Fig.2.

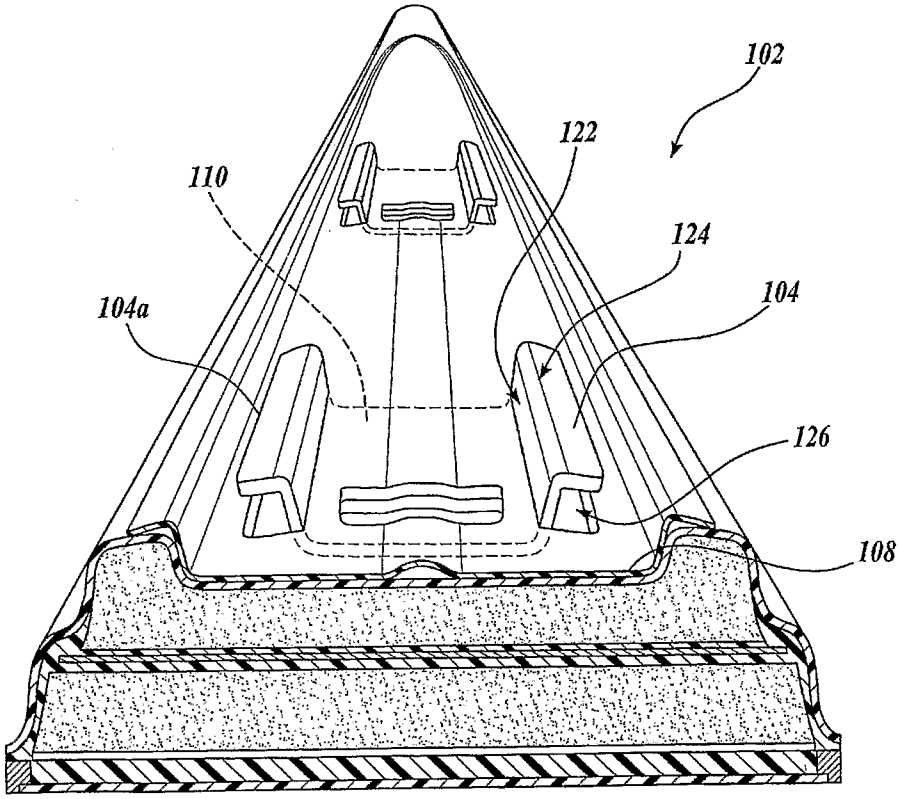


Fig.3.